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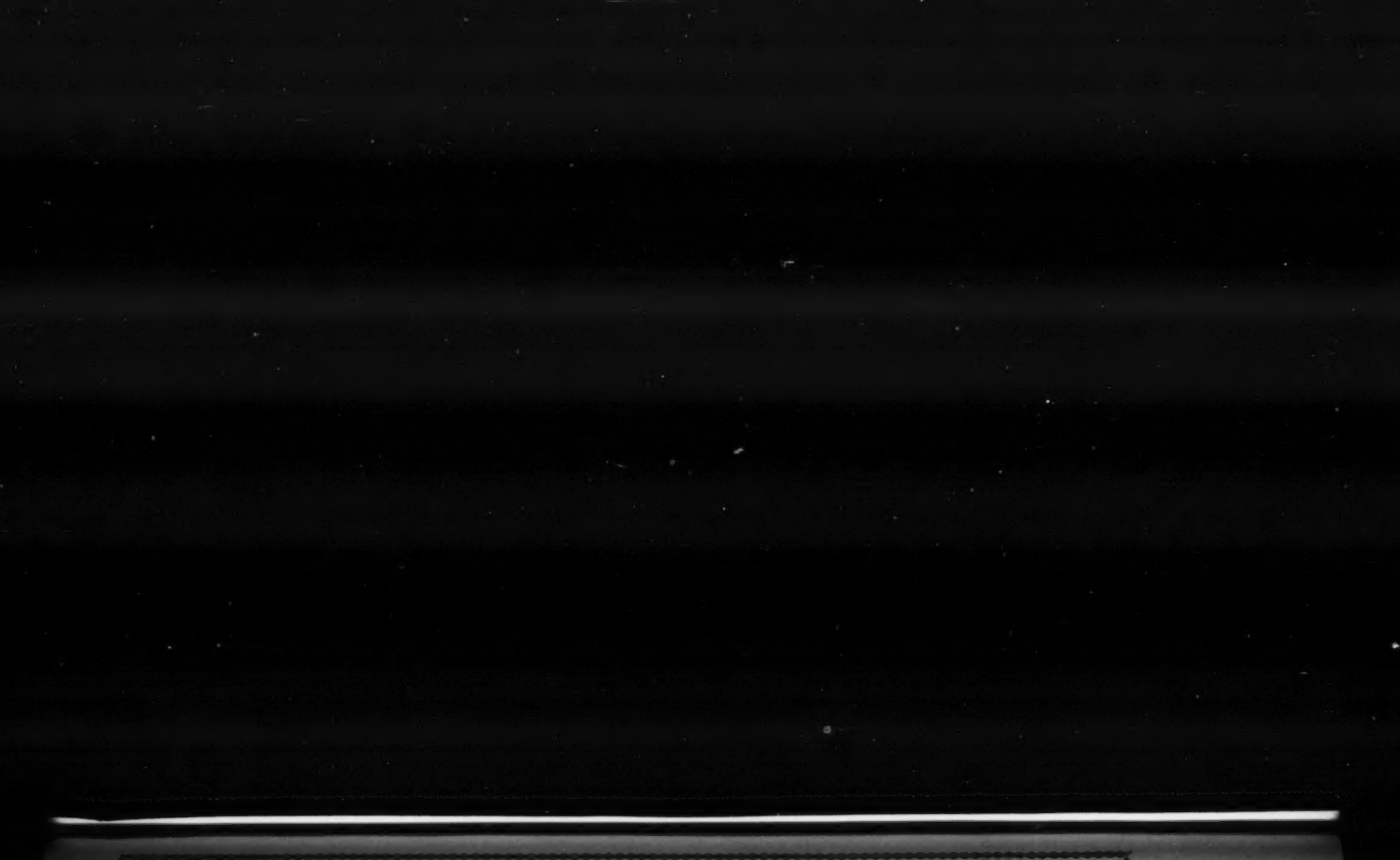

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THE MEDIEVAL MEDICAL UNIVERSITY AT PARIS

VERN L. BULLOUGH

Paris was the home of the great theological school of the thirteenth and fourteenth centuries and as such was the dominant university in Europe.[1] Any medical faculty at Paris was likely to be overshadowed but despite this the medical school at Paris was probably along with Mont-

[1] Unlike Montpellier and Salerno the medical university at Paris has had little attention in the standard English histories of medicine. The monograph material on the medical school is also considerably less. The basic source for any study of Paris is the four volume *Chartularium Universitatis Parisiensis* edited and annotated by H. Denifle and A. Chatelain (Paris: Delalain, 1889-1897). This will be referred to as *Chartularium*. Another valuable collection is the *Commentaires de la Faculté de médecine de l'Université de Paris (1395-1516)*, edited and annotated with an introduction by Ernest Wickersheimer (Collection de documents inédits sur l'histoire de France. Paris: Imprimerie nationale, 1915), to be abbreviated as *Commentaires*. As the title implies the commentaries do not begin until 1395 but the essay by Wickersheimer is extremely valuable. Also helpful at times is the *Ordonnances des rois de France*, edited by Eusèbe Jacob de Laurière, Denis François Secousse, *et al.* (21 volumes, Paris: 1723-1849).

The starting point for any work on the University of Paris or any other university is Hastings Rashdall, *The Universities of Europe in the Middle Ages* (new ed., F. M. Powicke and A. B. Emden, 3 vols., Oxford: Clarendon Press, 1936). Also valuable is Theodor Puschmann, *A History of Medical Education*, translated by Evan H. Hare (London: H. K. Lewis, 1896). Puschmann pays little attention to Paris but he does have some valuable insights. Other books and monographs that I found helpful include: [Jean-Bapt. Louis Chomel], *Essai historique sur la médecine en France* (Paris: Lottin l'ainé, 1762). This contains the medical statutes for the year 1350 unavailable elsewhere. Stephen d'Irsay, "Teachers and Textbooks of Medicine in the Mediaeval University of

pellier, and Bologna, one of the three most important in Europe. The university at Paris deserves study for another reason. It, along with Bologna, was what Hastings Rashdall called the archetypal university.[2] By this he meant that nearly all the *studia generalia*[3] in Europe were (1) either established by secessions of students or masters from Bologna or Paris, or (2) their development was due more or less to direct and conscious imitation of the scholastic guilds of these two great schools.[4] In any case Paris or Bologna served as the model, and as a result the Parisian medical organization was widely imitated.

Medical teaching at Paris cannot be traced back as far as it can at Salerno or Montpellier, but by the beginning of the thirteenth century it was evidently well established. Alexander of Neckam who studied at Paris between 1175 and 1195 recorded that:

> Hic florent artes, coelestis pagina regnat,
> Stant leges, lucet ius: medicina viget.[5]

William of Armorica (or le Breton) stated that in 1210

> . . . letters flourished at Paris. Never before in any time or in any part of the world, whether in Athens or in Egypt, had there been such a multitude of students. The reason for this must be sought not only in the admirable beauty of Paris, but

---

Paris," *Annals of Medical History*, *8* (1926), 234-39, and the same author's, "The Teaching and Practice of Medicine in the Medieval University of Paris," *Bulletin of the Society of Medical History of Chicago*, *4*, no. 1 (1928), 41-53. Harold Wellington Jones, "The Faculty of Medicine at Paris," *Annals of Medical History*, 3d s., *1* (1939), 1-23, is a general article but does include some helpful bibliographical hints. Pearl Kibre, "The Faculty of Medicine at Paris, Charlatanism and Unlicensed Medical Practices in the Later Middle Ages," *Bulletin of the History of Medicine*, *27* (1953), 1-20, covers an aspect of the university which I have not delved into here but which emphasizes the importance of a university on the medical scene. Alfred Franklin, *Recherches sur la bibliothèque de la Faculté de médecine de Paris* (Paris: Auguste Aubry, 1864), describes MSS dealing with the school but the bulk of his work covers the period after 1495. A[uguste] Corlieu, *L'ancienne Faculté de médecine de Paris* (Paris: V. Adrien Delhaye et ce., 1877), also deals mainly with the period after 1400.

[2] Rashdall, *op. cit.*, I, 16.

[3] By *studium generale* Rashdall meant a school that (a) attracted or at least invited students from all parts of Europe; (b) offered higher education in one or more of the specialized fields of law, theology, or medicine, and (c) had a teaching staff of masters in the specialized faculty or faculties (*ibid.*, I, 6-7.).

[4] *Ibid.*, I, 16. This secession was a common thing in the Middle Ages. Through it the students and masters could retain some control over the townspeople or make better agreements for future sites. The students could also hold this threat over the masters and vice versa. Oxford, for example, was probably founded by such a secession.

[5] Alexander of Neckam, *De laudibus divinae sapientiae*, ed. Thomas Wright (Rolls Series; London: Longman, Green, Longman, Roberts and Green, 1863), p. 453, vss. 569-70.

also in the special privileges which King Philip and his father before him conferred upon the scholars. In that great city the study of the *trivium* and *quadrivium* [the basic arts course], of canon and civil law, as also of the science which empowers one to preserve the health of the body and cure its ills were held in high esteem. But the crowd pressed with a special zeal about the chairs where Holy Scripture was taught, or where the problems of theology were solved.[6]

The first official record of medical teaching by the university comes from an episcopal mandate for the year 1213. In that year Pope Innocent III gave a decision in a quarrel between the masters and students on one part and Johannes, chancellor of Paris, on the other. The pope referred to *de phisicis* and gave the chancellor the right to license lectures in that subject.[7] The word *phisica* in this connection seems to indicate medicine but it is not until 1251 that the word medicine appears in the language of the university.[8]

In 1231 Pope Gregory IX referred in a letter to *magistri artium et phisice facultatis*, indicating perhaps that organized teaching of medicine existed.[9] From this reference to masters in art and medicine some authorities believe that the faculties of art and medicine were one instead of two bodies.[10] Even though both faculties were combined at Bologna, it is rather doubtful that they were at Paris. Evidence for a separate existence comes from a distinction of 1213 in the licensing procedures between the scholars and masters *de phisicis* and those in arts.[11] The statutes for that year required the chancellor to grant licenses to all candidates in theology, law, and medicine (*de phisicis*), recommended by the majority of masters teaching in those subjects. However, in the arts faculty, the recommendation was to be given by six selected masters chosen by the other masters and the chancellor. In their recommendations the masters of theology and law spoke *in verbo veritatis*, the physician *dabunt fidem*, while the masters of arts had to swear *fide corporaliter prestita*. The two faculties of art and medicine apparently had separate regulations, indicating, I feel, separate entities.

[6] William le Breton, *Gesta Philippi Augusti*, in *Oeuvres de Rigord et de Guillaume le Breton*, ed. H. François Delaborde (Paris: Librairie Renouard, 1882), I, 230.

[7] *Chartularium*, I, No. 16, 75-76.

[8] Later the term *phisica* is used to denote subjects in the liberal arts but this particular reference seems to be synonymous with medicine. For a different use of the word see *ibid.*, II, No. 1040, 504, where there is reference to "grammatica, logica, phisica et cetere inferiores sciencie."

[9] *Ibid.*, I, No. 89, 144-45.

[10] Guy de Chauliac, *La grande chirurgie*, ed. and trans. into modern French by E. Nicaise (Paris: Félix Alcan, 1890), p. liv. The Roman numerals refer to the introduction by Nicaise.

[11] *Chartularium*, I, No. 16, 75-76.

Further evidence that the two faculties were independent of each other is derived from the statutes for the arts faculty issued by Robert de Courçon in 1215.[12] No mention is made of medicine or medical works in these statutes nor in the arts statutes from 1255.[13] In any case there can be no doubt as to the independence of the medical faculty in 1255 when there is a reference, in 1253, to four separate faculties at the university including medicine, theology, law, and the arts.[14]

Regulations for the faculty of medicine, however, are not known before 1270-74.[15] In these statutes the terms scholar, bachelor, licentiate, and master have appeared indicating a full hierarchical development for the medical school. Since these terms are important to understanding medical education it might be well to investigate the meaning of each in the light of these and subsequent regulations. The sources at Paris allow this to be done in greater detail than at any other medical faculty during this time.

The term scholar, as used around 1200, seemed to mean both masters and students[16] but later usage gave it a definite connotation of students who were not yet bachelors. No information as to the age of the scholars is available from any of the statutes during the period under study. From this silence, imposed both at Paris and Montpellier, it might be assumed that there was no definite age for students in medicine as long as they had met certain other requirements. A Paris document from the year 1385, however, does give the age of three medical students all of whom were also masters of arts. The students gave testimony in the struggle of the university with the chancellor. As part of their testimony they gave their age.[17] The two eldest of the witnesses were twenty-two while the youngest was twenty,[18] an indication that the medieval medical student was slightly younger than his modern counterpart. From later accounts at the university it is evident that the youngest student witness was a beginning student in medicine since two years later he was listed as a third year student.[19] By 1393 he was a master in medicine.[20] This accidental testimony as to the age of the medical scholars would correspond

[12] *Ibid.*, I, No. 20, 78-80.
[13] *Ibid.*, I, No. 246, 277-79.
[14] *Ibid.*, I, No. 230, 252.
[15] *Ibid.*, I, Nos. 433-34, 444, 451-56, pp. 88-90, 502, 515-18.
[16] *Ibid.*, I, No. 1, 59-61.
[17] *Ibid.*, II, No. 1513, 368-89.
[18] *Ibid.*, III, No. 1513, 382, 384, 385.
[19] *Ibid.*, III, No. 1541, 459.
[20] *Ibid.*, III, No. 1603, 551.

to what is known about the general age of the arts students. Rashdall estimated that despite a considerable variation in the age of admission, the freshman in arts, as a general rule, would be between thirteen and sixteen years of age.[21] Twenty was the minimum age for the mastership of arts at Paris and the full course lasted seven years. Thus twenty would appear to be almost the minimal age for medical students.

Not all students in medicine during the thirteenth and fourteenth centuries were masters of art but it became more and more advantageous to the students to have received their master's degree and apparently the majority of them did so. In the statutes for 1270-74 the candidate with a license in arts was required to have studied medicine for five and a half years before he could be licensed in medicine, while those without the licentiate were required to spend six years.[22] Apparently more stress was later put on the arts degree, for in 1350 the master of arts was only required to have thirty-six months of course work for a bachelor's degree but the non-master spent twelve additional months.[23] By the end of the fourteenth century most medical students and masters were also masters of arts. In 1362 the masters of the faculty of medicine were included on a roll to be sent to the pope (*de beneficiis inferius annotatis . . . dignemini misercorditer providere cum acceptatione*) and the statement *omnes magistri in artibus* is included.[24] In 1365 another roll of masters appears and all save one master have after their names such designations as *in art. Paris. et in medicina mag.* The lone exception was the beadle of the faculty of medicine.[25] In another list of twenty-six masters from 1379 all but two were masters in both arts and medicine. One of the exceptions was the beadle of the earlier list. The other was a certain Theobaldus de Chymereyo who was listed just as *mag. in med.*[26] By the fifteenth century the degree of master or licentiate in arts was required before one could become a master in medicine.[27] However, even before this all medical students, whether or not they were masters of arts, had had previous training in the arts. Under what circumstances the student could be admitted without the degree of A. M. is unknown but perhaps it was possible in the case of older students.

When the scholar had completed certain requirements he could be-

[21] Rashdall, *op. cit.*, III, 352-53.

[22] *Chartularium*, I, No. 453, 517. In 1331 the licentiate in arts could give a medical course after thirty-four months of study while the non-licentiate had to spend thirty-six months. *Ibid.*, II, No. 933, 379.

[23] Chomel, *op. cit.*, pp. 148-49.

[24] *Chartularium*, III, No. 1264, 81.

[25] *Ibid.*, III, No. 1306, 128-29.

[26] *Ibid.*, III, No. 1432, 250-51.

[27] *Ibid.*, IV, No. 2274, 454.

come a bachelor and give cursory lectures. In 1270-74 these requirements included at least thirty-two months of actual study, not including vacations. During his studies the scholar was required to have responded[28] twice concerning a question in formal disputation in the classes of two masters, or at least once in general disputation. If he passed this successfully he then swore to observe the ordinances, statutes, honors, and customs of the faculty. He also swore that every book on which he would give cursory lectures he himself had heard in ordinary lectures.[29]

The actual steps in the promotion to bachelor are not listed in any of the documents from this period. One authority, Ernest Wickersheimer, has shown that later three stages were required before the degree was conferred: the *examen general, probatio temporis*, and *examen particulare*.[30] Evidence for all three of these stages is found in the statutes of 1270-74 but they are not so listed. The *examen generale* took place before the regent masters; it probably was an outgrowth of the general disputation mentioned above. In some documents this phase is called the *examen in communibus*.[31] For the second step the student gave evidence that he had studied the required period at Paris. A number of such documents are extant from the fourteenth century.[32] The last stage, the *examen particulare*, was defined in the statutes of 1350. In this phase the candidate was examined by four masters. Two of the examiners were chosen from the older masters and two from the younger ones at three different times during the year, near Easter, Holy Cross (Sept. 14), and Christmas. The frequency of election might indicate that the examinations were given at least three times a year. No scholar was admitted to the *examen particulare* unless he had been approved by the faculty, probably in the *examen generale*. During the examination, questions on both the theory and practice of medicine were asked and the scholar was required to take part in a dispute before the examiners. Results of the examination were given to

[28] In this type of dispute a teacher put a problem and the student or *respondens* gave a preliminary solution of the question and then had to answer the objections raised by the other participants in the dispute. See A. G. Little and F. Pelster, *Oxford Theology and Theologians* (Oxford Historical Society Publications, XCVI, Oxford: Clarendon Press, 1934), 31-33.

[29] *Chartularium*, I, No. 452, 516-17.

[30] *Commentaires*, p. xx. The Roman numerals refer to the introduction by Wickersheimer.

[31] *Ibid.*, p. 168.

[32] See for example *Chartularium*, II, No. 804, 250, which states: "Johannes de Jotro in festo S. Marci probavit [tempus auditionis] ordinarie sub magistro Remigio de Mariniaco, cursorie anno MCCCXXII sub magistro Johanne Bostol et Stephano de Nogento; item sub magistro Egidio de Raveriis; item a Johanne de Monasterio."

the dean who in turn reported them to the faculty. The faculty then voted to admit or refuse the candidate. In order to protect the examiners from the aggressions of unsuccessful candidates, all candidates had to swear not to harm their examiners in case of failure.[33] The successful candidate took an oath to observe the statutes, etc., and paid his fees: four purses to the faculty, and twenty *solidi* Parisian to the servant (*servienti*), i. e., the beadle.[34]

After receiving the bachelor's degree the student then undertook work for his license. To receive this he had to have attended medical lectures for a total of five and a half years (including his days as a scholar). If he was not a licentiate in art, six years attendance was required.[35] He had to prove that he had met the resident requirements with the testimony of at least two witnesses. He was to have given four courses (cursory)[36] on books which he had previously had training in from a master.[37] Two of the books on which he had given lectures were to be with commentary and two without. At least one was to deal with practice.[38] According to the statutes of 1350 his courses were to cover a full book and not just part of a book.[39] The bachelors were to stick to medical books and authors for their lectures except for two non-medical books, namely Aristotle's *De animalibus* and *Meteorologica*.[40] The bachelors were allowed little freedom in their courses. Even the number of lectures or sessions devoted to any one book was defined. For example they could expound on some of the Hippocratic works for fifty lessons and on others only ten.[41]

Before the licentiate was conferred on the bachelor an assembly of masters was held with each master examining the candidate on a question *sollempnelment*. The chancellor then called on the masters for their verdict [42] which was probably based on the decision of the majority.[43] The

[33] Chomel, *op. cit.*, pp. 146-48.

[34] *Chartularium*, I, No. 454, 517-18. Another statute of the same period (*ibid.*, I, No. 452, 516) has much the same wording but uses the word beadle instead of *servienti*. In the second statute the beadle receives at least one purse instead of the twenty *solidi*.

[35] *Ibid.*, I, No. 453, 517.

[36] *Ibid.*, II, No. 934, 382-83. See also *Ordonnances des rois de France*, II, 70-71.

[37] *Chartularium*, I, No. 452, 546.

[38] *Ibid.*, II, No. 933, 379.

[39] Chomel, *op. cit.*, pp. 153-54. The statutes added that if two books by different authors were bound together it was necessary to separate these for lecture purposes.

[40] *Ibid.*, p. 150.

[41] *Ibid.*, pp. 123-26.

[42] *Chartularium*, II, No. 934, 382-83. Also *Ordonnances*, II, 70-71. This ordinance was approved by the king because it was good, just, reasonable, and profitable for the *santé* of the human body. It is one of the few statutes at Paris given by the king rather than by the pope or bishop.

[43] *Chartularium*, I, No. 16, 76.

degree of licentiate was only given in alternate years, called jubilee years, at Paris.[44] These jubilee years were the odd numbered years.[45]

The chancellor's right to confer the license had been recognized as early as the year 1213 [46] but his power over this degree was weakened during the thirteenth and fourteenth centuries.[47] The statutes of 1270-74 required the master under whom the candidate had studied to testify as to his fitness in the presence of the chancellor and the other masters, before the chancellor could award the degree.[48] This practice was continued with modifications. To prevent any one master from monopolizing the eligible bachelors in 1335 it was stipulated that no master could present more than two bachelors for the license at any one time.[49]

On the day before the ceremony of licensing was held, messengers of the chancellor presented certificates to the successful candidates who received them in their rooms or houses and served them cakes and wine. Through the messengers the chancellor received two *denarios aureos* from each successful candidate.[50] The ceremony of licensing was probably similar to that in the other faculties. In these ceremonies the successful candidates went to the place where the ceremony was to be held in full academic dress accompanied by the rectors and proctors, preceded by the beadles of the faculty. The candidate was then presented to the chancellor. Then kneeling before him he received his license in the name of the Holy Trinity and was given an apostolic benediction.[51]

A license normally gave the candidate the right to teach and practice medicine.[52] Even though the licentiate had been given the chancellor's

[44] Rashdall, *op. cit.*, I, 480.

[45] In the spring of 1442 some bachelors demanded to be admitted to examination for the licentiate even though it was not a jubilee year but their request was refused by the masters. *Commentaires*, pp. 170-71. See also *Chartularium*, II, No. 934, 382; *Ordonnances*, II, 70-71.

[46] *Chartularium*, I, No. 16, 75-76.

[47] *Ibid.*, II, Nos. 918-43, 349-99. In this series of documents the litigation between the chancellor and the faculty in the period 1330-32 is recorded. It was brought about by the chancellor's attempt to license a bachelor not presented by the faculty, and as a result the chancellor's powers were curtailed.

[48] *Ibid.*, I, No. 453, 517.

[49] *Ibid.*, II, No. 996, 455. It was the custom for the master who acted in such a capacity to receive a fee. See *Commentaires*, p. 48.

[50] *Chartularium*, III, No. 1520, 404-05. For a slightly earlier period see *ibid.*, II, No. 1185, 683-85. This dealt with theology but the two ceremonies were probably similar.

[51] Rashdall, *op. cit.*, I, 461.

[52] *Chartularium*, II, No. 943, 398. In this case a certain Guido de Navarra received the license *ad practicam solum*. Since this license was given during the struggle between the chancellor and faculty it may not be typical.

blessing he was not yet a full master (or doctor)[53] of medicine. This he became only after being enlisted into the society of his colleagues, usually after a specified length of time. In 1350 an interval of six months was required between the licentiate and mastership.[54] The prospective master had to have practiced medicine outside of Paris for two summers or in Paris for two years before he was eligible to receive his master's degree.[55] Probably most of the students had filled this requirement during the summers they were not lecturing or attending classes. Since the vacation at Paris in 1350 lasted from the eve of the Feast of the Apostles Saints Peter and Paul (June 29) to the day after the Exaltation of the Holy Cross (Sept. 14),[56] the student might practice about five months. The official academic year did not begin until November 1[57] so that perhaps advanced students might be able to practice until then. This is similar to a provision at Montpellier[58] indicating that internship might be older than is generally thought. It is possible that the period between licensing and receiving the master's degree could also be spent in practice.

Before he could be initiated into the guild of masters, the licentiate had to take part in two solemn disputations known as *vesperiae* and *inceptio*. The vesperies, so called because they were held in the afternoon, took place on any reading or dispute day. All masters and scholars were supposed to attend. At these gatherings the candidate presented and defended a thesis and later acted as a respondent for a second thesis.[59] At inception the master-to-be gave an introductory lecture before all the faculty which then debated various phases of the presentation. When the disputes had been completed the candidate gave a summing up, then received the magisterial biretta, the kiss of fellowship, and a book from the presiding regent. He then took his seat with the masters.[60]

All masters of medicine at Paris were required to be unmarried, and apparently so were the students.[61] However, none of the students or

[53] The term doctor was used in 1271 (*ibid.*, I, No. 434, 489) "doctores in facultate medicine Parisius regentes" but the term master was most often used in the thirteenth and fourteenth centuries.

[54] Chomel, *op. cit.*, p. 153.

[55] *Chartularium*, II, No. 996, 454-55.

[56] Chomel, *op. cit.*, p. 161.

[57] *Chartularium*, II, No. 1017, 480.

[58] *Cartulaire de l'Université de Montpellier*, published under the auspices of the Conseil Général des Facultés de Montpellier (Montpellier: Richard Frères, 1890), I (period 1181-1400), No. 5, 186-90.

[59] Little and Pelster, *op. cit.*, pp. 45-46.

[60] *Ibid.*, pp. 49-50. See also Rashdall, *op. cit.*, I, 462.

[61] It was not until 1452 that the requirement for celibacy in the Paris medical faculty

masters at Paris or elsewhere was a member of the regular clergy (monks) although many were probably secular clerics.[63] The regular clergy had been prohibited from practicing medicine by several councils including Rheims in 1131,[64] the second Lateran in 1139,[65] and Tours in 1163.[66] The regent masters at Paris, those who taught or were willing to teach, made up the medical faculty.[68] In the roll of the faculty of medicine for the year 1387, however, both regent and non-regent masters are listed.[67] Apparently the ordinary business of the faculty was carried out by the masters regent, but at times the non-regent masters were called in.[68] This is because the medical university not only included the teachers and students but the whole body of legally qualified physicians in Paris. Every physician who was a licentiate and master was able to teach but not all did at any one time.[69] In 1403 a third classification appears, that of the absentees.[70] These were masters who did not reside in Paris though their position with regard to the faculty is not quite clear.

At the head of the faculty was the dean, a position which dated from at least the year 1267 if not earlier.[71] His duties were defined in 1350 as the observation and conservation of the statutes of the medical school. He was to note the decisions of the masters in assembly and see to it that the right courses were given. The seal and chest of the faculty were in his care and he was to keep an account of the expenses and receipts.[72] The dean was elected by the other masters for a one-year term but was eligible for re-election. Election for the deanship took place on the Saturday following All Saints' Day [73] (Nov. 1), the beginning of the academic year.

was abolished. See *Chartularium*, IV, No. 2690, 723. Previous to this, if a master was married he lost his regency.

[63] They were, however, usually in the minor orders.

[64] Joannes Dominicus Mansi *et al.*, *Sacrorum conciliorum . . . collectio* (new edition; Florence and Venice, 1759-98), XXI, 459.

[65] *Ibid.*, 528.

[66] *Ibid.*, 1179.

[67] *Chartularium*, I, No. 461, 531. Apparently it was possible for a regent who had become non-regent to teach again. To do this he had to take part in a dispute known as *resumptio*. See Little and Pelster, *op. cit.*, pp. 52-53.

[68] *Chartularium*, III, No. 1540, 448. It is possible that some of the regent masters had married and through this had become non-regent.

[69] In 1393 the masters regent and non-regent met together. *Ibid.*, III, No. 1603, 550-51.

[70] Puschmann, *op. cit.*, p. 229.

[71] *Chartularium*, IV, No. 1795, 78-80.

[72] In that year Petrus Lemovicensis was dean. *Ibid.*, I, No. 416, 468.

[73] Chomel, *op. cit.*, pp. 143-46.

[74] *Chartularium*, II, No. 1017, 480.

The beadle (*bidellus* or *serviens*) was to assist the dean. The term and office appear in a statute of the late thirteenth century but the position was probably older.[74] The beadle was required to take an oath to the dean before taking office.[75] He was to convoke the assemblies of the masters,[76] assist in examinations, disputes, masses, vigils, and in general make himself useful. He announced the courses of the regents and of the bachelors at the beginning of the year.[77] An assistant, the under beadle or subbeadle, aided him in carrying out his activities.[78]

The dean of the faculty was under the rector of the university. Technically, the rector had originally been the head of the artists' university only but through acting as agent for the whole university in the collection of money, the conduct of litigation, and the execution of decrees, the office had come to exercise a great deal more control. In effect the rector was the head of the whole university,[79] though still elected only by the faculty of arts.

Most of the early universities, including Paris, had developed from cathedral schools which were supervised by a representative of the bishop. This official was known as a chancellor and his early power came from the fact that as a representative of the bishop he could choose whom he would allow to teach. By the end of the fourteenth century, however, the powers of the chancellor had been limited to the conferring of the license. Such limitation had come only after a long struggle. At first the chancellor had granted or refused the license to teach on his own discretion. He had claimed the right to be the judge of the activities in the various schools as well as their head. His judgments had been enforced by his power of excommunication and imprisonment, even though he technically was not a member of the university. In order to counteract the chancellor's powers the masters had refused to recognize a new master unless he met with their approval. To gain this recognition a new master or teacher swore to follow the rules and regulations the teachers' guild had drawn up.[80] This association of masters had originally been formed as a weapon against the chancellor but its powers continued to grow. The masters' guild could not prevent a licentiate of whom they disapproved

[74] *Ibid.*, I, No. 452, 516.
[75] *Ibid.*, II, No. 697, 157.
[76] *Ibid.*, II, No. 923, 358.
[77] Chomel, *op. cit.*, pp. 158-59.
[78] *Chartularium*, III, No. 1603, 551.
[79] Rashdall, *op. cit.*, I, 325.
[80] *Chartularium*, I, No. 433, 488.

from teaching but they could refuse to dispute with him and also they could refuse to recognize his scholars.[81] The final result was the loss of independence by the chancellor in the issuing of the license. It also led to the appearance of the two degrees discussed in this paper, the license signifying the approval of the chancellor; the master's degree indicating acceptance by the masters.

Little is known about the subject matter in medicine at Paris during the thirteenth and fourteenth centuries. What knowledge we have comes from the lists of textbooks known to have been in use. The first record of books that might have been in the hands of Parisian medical students is derived from a list of books in a Gonville and Caius College (Cambridge) manuscript of the thirteenth century. Charles Homer Haskins attributed the manuscript to Alexander of Neckam who was at Paris between 1175 and 1195.[83] If this surmise is correct, and there appears to be little reason for doubting it, the medical works listed would give a picture of the books available in medicine at the beginning of the thirteenth century.[83] The authors and works mentioned included: Johannitius,[84] the *Aphorisms* and *Prognostics* of Hippocrates, Galen's *Tegni* and *Pantegni*,[85] Isaac (spelled Ysaac) *On Universal Diets*, *On Particular Diets*, and *On Urines*,[86] the *Viaticum* of Constantinus,[87] with his books on *Urines* and *Pulses*,[88] as well as books by Dioscorides, Macer,[89] and Alexander.[90] This list shows familiarity with the early translations from the Arabic made mainly at Salerno. The omission of the *Versus Egidii*, composed by Gilles de Corbeil, between 1190 and 1220, probably indicates that the list was composed before his writing. The exclusion of Avicenna, who became extremely prominent in the thirteenth century, also dates the list as around 1200.[91]

[81] Rashdall, *op. cit.*, I, 305-06.

[83] Charles Homer Haskins, *Studies in the History of Mediaeval Science* (Cambridge: Harvard University Press, 1927), pp. 357-71.

[83] *Ibid.*, 374-75.

[84] Johannitius, i. e. Honein ben Ishak, the author of the *Isagoge*.

[85] The real author of the *Pantegni* was not Galen but Ali ibn el-Abbas, an Arab physician who died in 994. He was also known as al-Majusi or Magus.

[86] Abu Jakub Ishak ben Soleiman el-Israeli (Isaac Judeaus was an Egyptian Jew who lived in the ninth and tenth centuries.

[87] Probably a translation by Constantine from the work of Ibn al-Jazzar.

[88] Probably refers to the works of Theophilus and Philaretus.

[89] Macer, the second title of *De naturis herbarum*, now attributed to Odo of Meung-sur-Loire who wrote in the eleventh century.

[90] I. e., Alexander of Tralles.

[91] Haskins, *op. cit.*, p. 368.

The first official list of texts at Paris dates from 1270-74.[92] This list was given in connection with the requirements for the license in medicine. It included the *Viaticum* (incorrectly attributed to Isaac), the works of Isaac, specifically the book *On Particular Diets*, the *Antidotarium* of Nicholas,[93] and the *Ars medicinae*.[94] Also included in the list as supplemental reading were the *Versus Egidii*.[95] There is not a great deal of difference in the two lists since the *Ars medicinae* probably included works of Hippocrates, Galen, Johannitius, and Ibn al-Jazzar. The *Antidotarium* had much the same information as Dioscorides and Alexander.[96] From the list of texts it appears that the basis of medical education at Paris was much the same at the beginning and end of the thirteenth century although the influence of the Salernitan translations is much more evident at the end.

A third list of books dates from 1395. This list is given in an accounting of the books which Peter de Vallibus (Pierre de Vaulx), the new dean, received from his predecessor.[97] In this list the following works were included: Simon Januensis, *Clavis sanationis*;[98] Averroes, *Colliget*;[99] Avicenna's *Canon* with commentary; Johannes de Sancto Amando, *Concordantiae*;[100] Mesue the Younger, *De simplicibus medicinis* and *De practica*; Nicholas Myrepsus, *Antidotarium clarificatum*;[101] Petrus

[92] *Chartularium*, I, No. 45, 517.

[93] One of the chief pharmacopeias of the middle ages.

[94] The *Ars medica* was probably a group of texts which included the *Aphorisms* and *Prognostics* of Hippocrates, the *Tegni* of Galen, the treatises of Philaretus and Theophilus, and the introduction to Galen by Honein ben Ishak. Translation of the *Ars medica* is attributed to Constantine the African. See Haskins, *op. cit.*, p. 369.

[95] These were the didactic poems of Gilles de Corbeil written between 1190 and 1220 and included *De pulsibus, De urinis, De laudibus et virtutibus compositorum medicaminum* and *De signis et sinthomatibus egritudinum*.

[96] This list is very similar to one at Salerno for the year 1280 and for this reason there is some feeling that the Salernitan list might have been copied from the Paris list. See Salvatore de Renzi, *Collectio Salernitana* (Naples, 1852-59), I, 361-62, and Haskins, *op. cit.*, p. 369. De Renzi dated the Salerno statute as 1276 but Haskins used 1280 and I have followed him.

[97] *Chartularium*, IV, No. 1723, 10.

[98] Simon Januensis was a Genoese physician of the thirteenth century. He translated many Arabic treatises and wrote the *Clavis sanationis*, a popular pharmacological treatise.

[99] Stephen d'Irsay, "Teachers and Textbooks of Medicine in the Medieval University of Paris," *op. cit.*, p. 237, called this and Avicenna's *Canon* a rationalized system of Galenism.

[100] Johannes de Sancto Amando was a canon of Tournai who wrote in the last half of the thirteenth century. His "Concordances" are based on Galen.

[101] Nicholas Myrepsus was a Byzantine physician of the thirteenth century. His *Antidotarium clarificatum* was, as the name implies, a pharmaceutical treatise.

de Sancto Floro, *Concordanciae*;[102] Albucasis, *Antidotarium*;[103] Rhazes, *Continens*, and one volume "in quo continentur plures libri Galieni." Dominance of Avicenna and the later Moslems is apparent in this list which might show that Paris was no longer dependent on the original Salernitan translations but rather that new translations were being made and new works were entering the medical curriculum.

Surgery was apparently not taught at the university during the thirteenth and fourteenth centuries although there were several surgeons in the city.[104] Perhaps one of the reasons why it was not taught was that the Fourth Lateran Council (1215) had forbidden subdeacons, deacons, and priests to practice any surgery which involved cutting or burning.[105] Though the interpretations of the prohibition might vary it seems to have been enforced at Paris, and a Paris statute itself forbade all bachelors from practicing manual surgery.[106] In 1408 a surgeon who wished to become a physician was not allowed to do so until he swore that he would no longer practice manual surgery.[107] As a result the teaching of surgery was carried on outside of the university. Much the same prohibitions applied to surgery were also applied to dissections since none are recorded for the thirteenth or fourteenth centuries. Paris was well behind Montpellier and Bologna on this count. The first record of a dissection at the university goes back to 1407. This was an autopsy performed on the bishop of Arras in order to determine the cause of his death since a councillor of the Duke of Burgundy was suffering from a similar disease. The faculty hoped to determine the location of the disease so that they could cure it in future patients.[108] Evidently they had had enough experience to perform the task which might indicate that autopsies had been made before. Anatomy was not a formal part of the university curriculum at this time, however. Soon after this dissection, others were performed. Perhaps this was an attempt by the physicians to counteract the influence of the surgeons. The physicians even gave some formal training to the barbers

[102] He was a professor in medicine at Paris. See *Chartularium*, IV, No. 1723, 10, n. 9.

[103] The *Antidotarium* was probably part of his larger work, the *Tesrif*.

[104] [François Quesnay], *Recherches critiques et historiques sur l'origine sur les divers états et sur les progrès de la chirurgie en France* (Paris: Charles Osmont, 1744).

[105] Mansi, *op. cit.*, XXII, 1007.

[106] Chomel, *op. cit.*, p. 150. In the same sentence the bachelor had to promise he would not marry. See also Chauliac, *op. cit.*, p. lvi.

[107] *Commentaires*, p. 47.

[108] Mary Niven Alston, "The Attitude of the Church Towards Dissection before 1500," *Bulletin of the History of Medicine, 16* (1944), 230-31.

including lessons in anatomy. However, it was not until 1494 that dissections were performed openly by the medical faculty.[109]

Paris by the end of the fourteenth century had reached a place of eminence in medical education. It had been moving with the new scientific trends of the time by changing its texts and curricula. But it had closed its doors to surgery and by the end of the fourteenth century its medical program seems to have been set. It was not so set that it could not admit dissections, but after 1400 little additional changes are made. The rigid exclusion of surgeons can be understood only in the light of medical politics in Paris.[110] To counteract this the physicians did train the barbers, but the resulting separation did irreparable harm to both medicine and surgery. Paris is important in the history of medical education for the development of the university organization which was diffused throughout Europe. Unhappily the exclusion of surgery often followed even though conditions in the new locations might differ. One wishes perhaps that Paris had not been quite so influential.

[109] *Commentaires*, p. xxv.

[110] I hope to develop this subject further in the future.

THE RHEOTOME AND ITS PREHISTORY: A STUDY IN THE HISTORICAL INTERRELATION OF ELECTROPHYSIOLOGY AND ELECTROMECHANICS *

H. E. HOFF and L. A. GEDDES

Introduction

One of the great nodal points in the history of science followed Galvani's discovery of the contraction produced in frogs' legs by contact of dissimilar metals, when, for a time, physics and physiology, electricity and neurophysiology occupied common fields. During this interesting and difficult period, it was not always clear what was physiological and what was physical, and many a physicist found in the frog the most convenient galvanometer. Physiologists in turn, seeking sensitivity and quantitative measurements, looked to the instruments of physics for decisive answers. Both were hampered by the problems of instrumentation, and surmounted the difficulties of that early electromechanical era only by the most ingenious combinations of physiological experiment and physical device.

The Rheotome, or current slicer, brought to the attention of physiologists by Bernstein,[1] was one of the most ingenious of these early instruments, both in its design and in its application. Making possible as it did the first graphic analysis of the time and amplitude course of the action current in nerve and muscle, it was in a real sense the first instrument of electrophysiology. Its history, and the events that led to it, are a chapter of no small importance in the story of the evolution of neurophysiology and its instrumentation. Naturally an account of its development must begin with some mention of the galvanometer itself, which was the immediate source of so much of the difficulty during this period, and caused Burdon-Sanderson to caution that, all too often, " the phenomena observed are those of the instruments we employ rather than those of the organs we explore " (1, p. 414).

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[1] *Bernstein, Julius (1839-1917).* Pupil of du Bois-Reymond, and the author of the " membrance theory " of bioelectricity, he held professorships in physiology in Heidelberg and Halle. His greatest contribution to experimental physiology, recounted here, was the plotting of the time course of the action current and the demonstration that it and the nerve impulse are identical. He was a son of Aaron and brother of Eduard Bernstein, well-known figures in the democratic movement in Germany.

The Galvanometer

It would be difficult to overestimate the tremendous impact of galvanism on the scientific world of Galvani's time. As Nobili [2] wrote in 1830, "for thirty years now frogs have been tormented with electricity, and the phenomena they exhibit still continue to excite the astonishment of an attentive observer" (2, p. 60). Nevertheless, the genius of Volta perceiving what Galvani, preoccupied with animal electricity, had failed to see, the science of electricity received its greatest directing force, and began its own development independent of animal electricity. Central to this impetus was the evolution of the voltaic cell, and in particular the creation of the voltaic pile, or "battery," of voltaic cells from alternate plates of copper and zinc arranged in series, providing a readily available source for the study of electric currents. From this sprang the contributions of Ohm and Ampère, Oersted and Faraday, and others, who laid the foundation for the scientific and industrial development of electricity.

In 1820 Oersted reported what Schweigger [3] later described as "the most interesting studies on magnetism that have been carried out in a thousand years" (3, p. 1), the discovery of electromagnetism; which provided the operational basis for the galvanometer, and much more.

Making a large voltaic battery of twenty cells, strong enough to heat a metallic wire red hot when connected across the battery, he observed the deflection of a compass needle placed near-by. Describing the experiment in 1820, he wrote,

> The opposite ends of the galvanic battery were joined by a metallic wire, which for shortness sake, we will call the *uniting conductor*, or the *uniting wire*. To the effect which takes place in this conductor, and in the surrounding space, we shall give the name of the *conflict* [4] *of electricity*.

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[2] *Nobili, Leopold (1784-1835)*. Italian physicist, graduate of the military school of Modena and captain of artillery in Napoleon's Russian campaign, he left the army to direct the Arsenal at Brescia and to become Professor of Physics and Natural History at Florence. He was the author of many valuable works on mechanics, heat, magnetism, and thermoelectricity, but his major single contribution was the creation of the astatic galvanometer described here.

[3] *Schweigger, Johan Salomo Chrystoph 1779-1857)*. German physicist, Professor of Physics and Mathematics in Bayreuth, Nuremberg, and Halle, and for many years editor of the *Journal für Chemie und Physik*. He displayed an interest in the relationship of mythology and science throughout life. A son was assistant to von Graefe and became a well known opthalmologist, and professor of that specialty in Berlin for 30 years. His greatest contribution was the multiplier or galvanometer described here.

[4] Oersted conceived that a continued series of electric shocks took place in the wire completing the circuit between the poles of the battery—a condition which he expressed

Let the straight part of this wire be placed horizontally above the magnetic needle, properly suspended, and parallel to it. If necessary, the uniting wire is bent so as to assume a proper position for the experiment. Things being in this state, the needle will be moved, and the end of it near the negative side of the battery will go westward (4, 5, p. 40).

To simplify demonstration and eliminate the bulky galvanic battery used in his first experiments, Oersted devised a number of miniature indicators consisting of a single galvanic cell, suspended in air by a fine wire, which would rotate when approached by a strong magnet held in the hand (6). One of these was described in the following terms in an English review of the work which is virtually a literal translation of the original.

We have here to notice also an important result obtained by Professor Oersted. He states that a plate of zinc (about three inches high and four inches broad) placed in, and by an arch of small wire connected with a trough nearly fitting it, made of thin copper and containing a mixture of one part of sulphuric acid, one part of nitric acid, and 60 parts of water, forms an apparatus, which, suspended by a very small wire (only sufficiently strong to bear its weight) will, if a powerful magnet be presented to it, exhibit magnetic polarity-turning its corresponding pole to the pole of the magnet (7, p. 394).

Schweigger was one of the first to take an interest in the new phenomenon of electromagnetism. As co-editor of the *Journal für Chemie und Physik*, he had the opportunity to see Oersted's reports in manuscript and had demonstrated the phenomenon to his classes. As had Oersted, Schweigger first attempted to improve the clarity of the demonstration by increasing the number of elements of the galvanic battery, with disappointing results.

Noticing that the magnetic needle was displaced in opposite directions when it was placed first above and then below the wire carrying the current, or when the polarity of the current was reversed, he deduced that

by the term "electrical conflict," denoting the clash, or shock, of physical bodies on coming together. The term electric "current" is older, having been used by Franklin, and earlier by Stephenson who wrote in 1747 (*Gentleman's Magazine*, 1747, *17*; 140-142) to suggest that certain experiments be made on electricity which he defined as a "kind of fluid lambent fire, produced by collecting and giving a vibrative motion, and new direction, to the fluids of ether and air." In his 7th experiment he asked "will not the frequent electrifying of bedsteads, bedding, wearing apparel, etc., render them much wholesomer, and more especially when persons are sick, or the constitution of the air bad, either from noxious exhalations, or a pestilential disposition? And will not the frequent exciting such *currents of ethereal fire* in bed-chambers serve to purify the air therein, and prove of more use for that purpose than ventilators, etc?" Note 8 (below) makes it clear that by 1799 Volta was using the term "electric current" much as we use it today.

the effect should be doubled if the wire looped round the compass with the needle within the plane of the coil. This in fact occurred, and, moreover, the effect was further multiplied when the wire was coiled not once but many times (3). From this observation began our knowledge of the importance of the number of turns in inductance electricity; it gave rise to the first name for the galvanometer; the *multiplier*.

Schweigger understood that the coil itself ought also to move in space were it freely suspended within a magnetic field, and attempted to make such an instrument by dipping the ends of a platinum wire suspended by a fine thread in cups of mercury to form a movable electrical contact. This first attempt failed, perhaps because of the excessive friction of the mercury, or undue stiffness of the suspension, and Schweigger at first suggested suspending an entire miniature galvanic cell, much as Oersted had already done. Soon, however, he succeeded in constructing a delicately-mounted moving coil in which the magnetic needle was dispensed with, and a strong magnetic rod was held near the movable coil.

In a later communication these principles were applied in the construction of a number of galvanometers of greater sensitivity (8), and it seems clear that Schweigger had by the time of his earliest papers produced prototypes of both moving-coil and moving-vane galvanometers. Application to indication of current strength appears not to have been explicitly suggested by Schweigger himself, and Schweigger's name "multiplier" implies simply an improved way of demonstrating the Oersted effect. There is nothing in the first paper of Schweigger to suggest that he was aware of the possibilities inherent in the production of *rotation* in the coil, certainly the most important practical implication of these experiments.

Between Schweigger's two reports in 1820 and 1826, and in the course of the next few years, a whole evolution was accomplished which need not be described here, however important it may be in the history of electricity; the great work of Ohm and Faraday and many lesser works, many concerned with improvements in the sensitivity of what soon was called a galvanometer.[5] One significant study of this period must however be mentioned; Nobili, an Italian physicist, reported to the Modena Academy of Sciences, Letters and Arts "On a new galvanometer," a translation in German appearing shortly thereafter in Schweigger's *Jour-*

[5] Describing the construction of the voltaic pile or battery (*Phil. Trans.* 1800, *90*; 403-431) Volta spoke of testing the strength of these new electrical generators by the "electrometer" of Cavallo, and in the next year W. H. Pepys used the term "galvanometer" in a "Description of a new galvanometer, and an account of some experiments made with Volta's pile upon several of the gases" (*Phil. Mag.* 1801, *10*; 38-42).

nal (9). In its construction Nobili employed a double coil of 72 turns wound in a figure eight. A highly ingenious arrangement of two magnetic needles was employed. One needle was located in each of the two openings. Both needles were rigidly connected and on the same suspension. They were parallel, but of opposite polarity. Since the current flowed in the opposite direction in the two coils because of the crossing of the wires at the waist, both needles moved in the same direction when

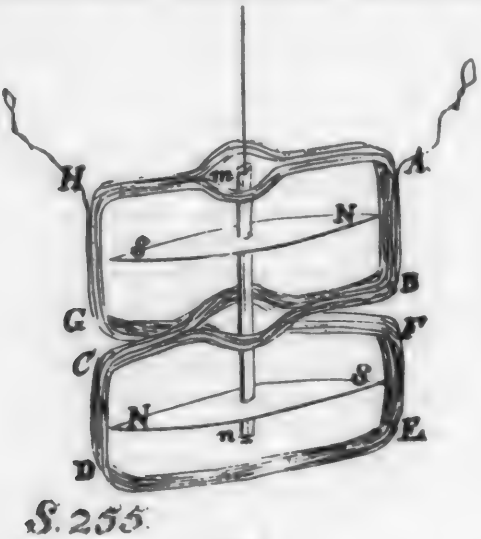

FIG. 1

Nobili's astatic galvanometer, as illustrated by Schweigger. From an addition by Schweigger to ref. 9 (pp. 254-256), Plate III, Fig. 6.

current was applied, while they responded in *opposite* direction to the earth's magnetic field, and thus mutually cancelled this disturbing force. This was the first astatic galvanometer, and Figure 1 is Schweigger's illustration of it.

This galvanometer, wrote Nobili, gave a deflection of 90 degrees when a simple thermocouple was made by wrapping the copper leads of the galvanometer around the two ends of a six-inch piece of iron wire, and one of the junctions was warmed in the hand. Its sensitivity [6] encouraged

[6] Writing some years later "On the instruments employed in electro-physiological researches" (Walker's *Electrical Magazine* 1845, *1*; 475-482) Matteucci advised that

Nobili to compare it with the most sensitive "galvanometer" hitherto available, Galvani's preparation of the decapitate trunk and hind quarters of a skinned frog (10).

Nobili and The "Intrinsic Current" of the Frog

As a preliminary experiment Nobili placed a skinned and decapitated frog so that its feet dipped in one glass of water or saline[7] solution and the trunk in another, and connected the fluid in the two glasses by a cotton or asbestos thread soaked in the solution. Thus no metals entered into the conducting arc; nevertheless the frog muscles contracted when the connection was made. This contraction Nobili at once recognized as the "galvanic contraction without metals," and he accepted its origin as the result of self-stimulation of the frog by its own intrinsic electricity; the "courant de la grenouille."

> Having recognized the frog current so promptly (he wrote), my first thought was to introduce a similar current in one of the most sensitive of my multipliers, to observe the indications it would give. I had such confidence in the instrument that I employed, that I was greatly astonished to see that the frog still contracted in the new circuit while the needle of the multiplier showed not the least movement. This result made me fear that the instrument was not capable of measuring the currents produced by conductors of the second class,[8] but before giving too much weight to this opinion I made a second attempt. I constructed another galvanometer, to which I gave all my attention so that it could succeed better than the preceeding ones. It was in fact much more delicate, and I had indisputable signs of the frog current. The glasses being filled with common water, the deviations were of a few degrees; but with the saline solution the first movements of the needle were of 10°, 20°, and even 30°. The current of the frog goes from the muscles to the nerves, that is to say, from the feet to the head. While frogs contract under the action of their intrinsic current only for a short time, the galvanometer shows signs of it for hours (10).

Even though the galvanometer could indeed detect the frog current,

"we may always judge of the sensibility of a galvanometer by the slowness of the oscillations of its magnetic system; the galvanometer is in possession of sufficient sensibility when its system makes one oscillation in a minute." This gives an idea of the response-times of galvanometers of this era.

[7] Saline solution was in common use in electrical experiments at this time and before, but there is no evidence of any realization of its physiological value. The concentration of this solution is unknown.

[8] "Besides the two methods already considered of producing an electric current," wrote Volta in 1799 (*Phil. Mag.* 1799, *4*; 163-171), "that is, by means of one or more moist conductors, or conductors of the second class, placed between two different metals or conductors of the first class . . . ," there is the current produced without metals in the third experiment of Galvani, the "contraction without metals."

Nobili found that a voltaic current too feeble to move the galvanometer would nevertheless evoke contractions in a frog. Thermoelectric currents, weakened by passing through fluid conductors, could be so reduced that they were unable to deflect his best galvanometers, but they would still cause vigorous contractions in the frog.

Studying the frog current somewhat further—and it was more or less incidental to his comparison of the physical with the physiological galvanometer—Nobili noted that

> the frog current has a certain direction and a certain force, and one may destroy it by directing it against another of equal intensity. If one prepares two frogs in the usual manner, and forms a galvanic circuit with them alone, by placing in reciprocal contact the nerve of one with the muscle of the other, both frogs contract; they remain motionless on the contrary, when one reverses the disposition of contacts, touching the nerve with the nerve, and the muscle with the muscle (10, p. 235).

Following the reasoning suggested by these observations, Nobili arranged frog preparations in series, placing the trunk of the second on the legs of the first, and so on to make a "voltaic pile" of frogs, and observed an increase in the deflection of the galvanometer.

Nobili may thus be credited with the first demonstration by physical instruments of the existence of the bioelectric current which today we recognize as the injury current. It is to be noted, however, that he made no special point of this demonstration apart from the fact that it showed that he was able to construct a galvanometer that approached, though it did not equal, the galvanoscopic frog in sensitivity. He accepted fully the evidence of the contractions of the frog as proof that the frog current did in fact exist. Reasoning that it must arise from conductors "enough different from each other to make an appreciable current in the frog,"[9] he added, "we shall often have the occasion to talk of this current, we shall call it for this reason, 'courant de la grenouille,' without bothering about the regions, whatever they are, that produce it" (10, p. 227). Two years later, he was to ascribe it to a form of thermoelectricity (2).

Nobili's subsequent electrophysiological studies turned toward the prob-

[9] Galvani's contraction without metals, continued Volta in the reference quoted in the preceding footnote, "render(s) more general the principles that conductors, by heterogeneous contact, that is, of two different from each other, become excitors of electricity, and confirm the beautiful law arising from it, that to produce an electric stream the circle must necessarily be formed from three different conductors. You see now in what the whole secret, the whole magic consists; and that it depends not merely on metals, as might have been believed, but on all the different conductors."

lems of electrotonus and had no further bearing upon the subject of this essay, and it was Matteucci,[10] another Italian, who was responsible for further developments in the detection and analysis of animal electricity.

Matteucci and the Muscle Current

Carlo Matteucci, physicist of Pisa, had for many years been a student of electricity, writing extensively on its purely physical aspects. By 1830, however, he inevitably became interested in "physiological electricity," placing electrodes in the peritoneal cavity of a living rabbit to observe the electrolytic changes produced by electric current (11). Later, in 1834, he became more directly involved with animal electricity, writing in an introductory sentence that "although we have spoken for quite a long time about the existence of animal electricity, it must nevertheless be admitted that we still lack a clear and precise phenomenon to demonstrate its existence" (12, p. 439). Here he discussed the recent observation of a current between the stomach and the liver of animals, attributed to differences in the acidity of the fluids of these organs. He mentioned also Nobili's work on the frog current and reported his own inability to confirm it, writing that "I isolated the nerve of the thigh of a frog by cutting away the muscular portion: the same current, always exciting contractions, never left the nerve to pass into the wires of the galvanometer, whose terminals touched the surface of the cut muscle" (12, p. 442).

Possibly because of this early disappointment, Matteucci apparently deserted the frog and devoted himself to the study of Torpedo, but, as he wrote in 1838,

> My studies on the electric phenomena of the torpedo of necessity led me to the examination of all the facts that could be related to an electric state inherent in animal organs. Apart from the electric fishes, the most remarkable among those relating to physiological electricity is the fact discovered by Galvani of the contraction obtained in folding back the muscles of a prepared frog upon the crural

[10] *Matteucci, Carlo (1811-1865).* Italian physicist and patriot, he gained a doctorate in mathematics in Bologna at the age of 18 and thereafter attended the Ecole Polytechnique in Paris for two years. After an ill-fated venture as a manufacturer of glue and fertilizer, he became pharmacist to the hospital at Ravenna and in 1841 was appointed to a chair in physics at Pisa through the intervention of Baron von Humboldt. A great patriot, he took part in the political upheavals of 1848-49, and thereafter became Director of Telegraphs for Tuscany, later a Senator of Tuscany, and finally Senator of Italy and Minister of Education. He received a prize in experimental physiology from the Academy of Sciences in 1840 and the Copley Medal from the Royal Society in 1848. His true value as a scientist has never been fully assessed, possibly because of the sheer number of papers he wrote—over 300, and his contributions have probably been underestimated.

nerves. This is truly a great fact, the entire importance of which has not been recognized. Volta, author of the celebrated electromotor doctrine, against which this fact was thrown by the school of Bologna, commenced at first by denying it, and while he admitted it in time, he made it depend upon a heterogeneity between tendinous and nervous substances, and some kind of animal liquid interposed. . . . Forty years have gone by without teaching us anything new about this subject, and it is to Nobili that we owe the clear establishment that these contractions are due to an electric current directed from the muscles to the nerves of the frog (13, pp. 93-95).

Analysing the "frog current" in greater detail Matteucci first noted that the self-induced contractions arose regularly only upon the make and, less often, at the break of the frog current, and thus are not a good index of the total behavior of that current. Moreover, preparations lost their ability to respond to their own currents before they fully disappeared. In such studies, therefore, he believed that "we must let the galvanometer speak" (13, p. 100). Next, he recognized the development of polarization in the electrodes or, perhaps, in the frog itself, writing,

Once any kind of conducting arc is established between the muscles of the legs and the nerves, or the other parts of the body of the frog that we have seen to be appropriate for exciting currents, a continuous electric current circulates, directed from the legs to the nerves, in the interior of the frog, and it is to secondary polarities developed on the platinum electrodes, and perhaps even on the members of the frog itself, that in great measure the reduction of the current is due (13, pp. 100-101).

Finding that a single leg gave as much current as an entire frog, he set out to answer the question "what are the parts of the frog which are absolutely necessary for the production of its current?" (14, p. 314). It soon became clear that nerves were not essential for the phenomenon, and the muscles alone, and even portions of muscles were equally effective. For this study he employed not only the galvanometer, but also the galvanoscopic preparation, which was particularly adapted to study of the currents produced by wounds in the depths of living muscles in situ.

I take for that purpose (he wrote) an active frog, and I begin by preparing it in the usual manner; then I promptly remove the bone and muscle of the thigh, leaving the nerve intact, and finally I cut the nerve at the point where it leaves the spine: in this manner I have only the leg of a frog to which is organically attached a long nerve fillet composed of the spinal and crural portions. . . . I introduce the prepared leg in a tube of varnished glass, or I place it on a sheet of sealing wax, or I hold it between my fingers with a piece of oiled silk. This precaution is necessary since without it one could attribute the contraction to the intrinsic current of the same frog, circulating through the observer (14, pp. 304-305).

Employing this rheoscopic limb, "I injure the muscles of any living animal whatever, and into the interior of the wound I insert the nerve of the leg, which I hold, insulated with the glass tube. As I move this nervous filament in the interior of the wound, I see immediately strong contractions in the leg. To always obtain them, it is necessary that one point of the nervous filament touches the depths of the wound, and that another point of the same nerve touches the edge of the wound" (14, p. 328). The galvanometer also gave evidence of a current when one electrode was plunged inside a wounded muscle and the other was placed on the outer, denuded surface of the muscle. Fish, birds, and mammals were employed in these studies, and later Matteucci had the opportunity to see the experiment succeed in a man who had suffered a wound in a muscle (14).

These observations were confirmed and extended by the fabrication of "muscle piles" after the manner of Nobili's "frog piles," and multiplication of the current was observed in the galvanometer when several muscles were arranged in series so that the cut transversal surface of one came in contact with the external surface of the next, and so on.

Thus, the somewhat vague "intrinsic current of the frog" was more precisely localized in the muscle as the "intrinsic current of muscle," and Matteucci concluded that

> It is in the muscular masses that the signs of the electric current are found, and always in establishing a circuit, with any kind of a conductor, between parts of these masses that differ, very probably, between themselves in structure and function; it is between the interior of the muscle and its surface that one always finds the current, directed, in the same muscle, from the interior to the surface.[11] Since the signs of electric current that we have obtained, although persisting more or less after the death of the animal, cease always after a certain time, which is all the greater as the animal belongs to an inferior order, it is necessary to conclude from this that: for the production of this current the organic disposition constituting the living muscular firbre is at least as necessary as that action, whatever it is, that maintains it in such a state" (14, pp. 335-336).

Two further observations by Matteucci embody his greatest contribution to an understanding of the action current; the first, the disappearance

[11] Du Bois-Reymond may well have been the first to use the term "muscular current" as he claimed in a polemic directed against Matteucci (*On Signor Carlo Matteucci's letter to H. Bence Jones, M.D., F. R. S., etc., editor of an abstract of Dr. Du Bois-Reymond's researches in animal electricity.* London, Churchhill, 1853). "I therefore invented and first used this term," Du Bois-Reymond wrote, "and it does not occur in Signor Matteucci's papers anterior to mine." It need hardly be argued that in this passage, clearly anterior to Du Bois-Reymond's first work, Matteucci had developed the concept of a muscle current.

of the intrinsic current during tetanus, and the other, the stimulation of a rheoscopic preparation by muscular contraction. Matteucci's publication habits were not overly orderly,[12] and it is difficult to be certain when these observations were first reported. It appears, however, that the first notice of the disappearance of the intrinsic muscle current during tetanus was in his so-called "Second Memoir on Animal Electricity" published in 1838 (13). In this memoir he reported in a section on "Causes Modifying the Frog Current," that

another factor greatly modifying the intrinsic current of the frog is its state of tetanus. It often happens with active specimens that in preparing them rapidly one sees them extend their legs and stiffen to such an extent that it is impossible to bend them; one can also, with a solution of strychnine or an extract of nux vomica, within a few minutes produce tetanic convulsions. The influence of the tetanus is such that the intrinsic current is lacking while the frog is attacked by it. We have no more contractions,[13] or signs on the galvanometer. If the animal is killed by poison, one does not succeed in finding it again, but if on the contrary the tetanus was produced by the stimulation given to the frog while preparing it, once

[12] From the beginning to the end of his career Du Bois-Reymond was irritated by Matteucci. In the introduction to the first volume of *Untersuchungen über thierische Elektricität* in 1848, he wrote referring to Matteucci, that, "This investigator has followed, for many years, a tactic all his own in the publication of his results. In countless articles in the most diverse journals, one sees the same material from him, often in unchanged form, brought forth as something new of importance. In these articles, which one might properly call plagarisms on himself, he interweaves a couple of really new experiments, which however, may be nothing more than unessential variations of those that have appeared before, or a couple of observations which barely cover the meagerness of such results."

Du Bois-Reymond was hardly more generous forty years later when he wrote that "It was once my intention to continue here the catalogue of Matteucci's electrophysiological works. But because of the custom of this writer to publish the same observation in various places, without mentioning that he was repeating what was already known, or without referring in the one place to the other, and because of the number of his publications running up into many hundreds, and their poorly defined contents, I found, despite extensive preparation, the undertaking disproportionately more time consuming and difficult than its completion would be worth. Matteucci's works have been so surpassed in all directions that hardly anyone will feel the need of examining them in the original. If this nevertheless seems to be the case, the literary references in *Fortschritte der Physik*, should provide access to all the more important sources. There one will find further information on a completely outdated subject, that already takes too much space in this book, the polemic forced upon me by Matteucci to protect my priority. Carlo Matteucci, who played so great a role in the history of electrophysiology, was born in Forli on July 20, 1811 and died in Florence on June 25, 1868. A handsome gravestone in Campo santo at Pisa preserves his memory even for those who never heard of a secondary contraction" (20).

[13] Here "contractions" is used in the sense of "twitches," or single excitations of the muscle. A muscle in tetanus would be fully contracted and unable to show individual twitches.

the convulsions have passed, the signs of the intrinsic current reappear (13, pp. 102-103).

Description of the stimulation of the rheoscopic frog by muscular contraction almost certainly appeared first in 1842 (15), although the observation was probably made somewhat earlier, for the author mentioned that he had communicated it to Mr. Dumas of the Academy of Sciences in a sealed package—a practice common at that time for establishing priority without publicly divulging the data.[14] In this report he wrote:

I place upon an insulated surface of waxed or varnished cloth a frog, prepared in the ordinary manner; then I prepare another frog so as to have only a leg with the nervous fillet or fascicle which comes from the marrow to the muscles of the leg. It is necessary to have care, not to be led into error, to remove all the muscles of the thigh, and that the nervous filament be thoroughly denuded.

Then I place the nervous filament upon the thighs of the first frog, in such a way that the filaments of the leg touched by the nervous filament do not come in contact with the thighs, and so that this filament is not under tension. . . . When one touches with a voltaic couple the lumbar nerves of the frog, at that instant the muscles of the thights contract: *at the same time, one sees the leg contract, whose nerve is resting upon the muscles set into contraction* (15, pp. 339-340).

Coating the first or donor muscle with gold leaf to form a low-resistance shunt, or interposing an insulating sheet between the muscle and the rheoscopic nerve suppressed the phenomenon, and Becquerel, with whom he repeated and varied his experiments, after being assured that an insulating sheet, although very thin, prevented the action of the muscles in contraction on the nerve placed on the surface of these muscles, concluded that these phenomena could not be explained without admitting an electric discharge in the act of contraction.

This learned physicist expressed himself thus in a note he was kind enough to send Matteucci:

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[14] A typical example of this practice is found in the history of anesthesia, as attested by the following complaint by Rice, referring to Jackson's "sealed packet" claim for priority: "It was cunning, also, in an eminent degree, for by depositing it at an early date, *sealed* as was done, it could remain in the proper hands until the value of the discovery was really manifest, when by giving due warning the seals could be broken and the early date of the claim made patent by the date of the deposit. Whereas on the other hand, if subsequent experiment should show that its use were dangerous, or did not possess the value which was at first anticipated, a letter sent at the proper time would reclaim the letter deposited *unopened*, and nothing would ever have been known about the famous claim of Dr. Jackson, if he could not even join in the hue and cry, and in heaping obloquy on *the dentist* who had the rashness to experiment with matters outside the line of his true business." (Rice, N. P., *Trials of a Public Benefactor*, New York, Pudney and Russell, 1859, p. 203.)

At the instant the frog contracts there is an electric discharge that passes into the end of the nerve of the leg when this extremity rests on the muscle, or is separated only by a band of wet paper. It is discharged by the gold-leaf, although this conducts electricity better than the nerve, a phenomenon analogous to what one observes in placing a torpedo on a metal plate that one holds in the hand; in this case the discharge passes in the metal and not in the hand. Finally, the interposition of a band of glazed or insulating paper ought to prevent the nerve of the leg from being affected.

All these effects could be produced only by derived currents, from which one is led to admit the production of an electric discharge at the instant the muscle contracts.

If experiments carried out in other directions come to confirm the conclusions that can be drawn from the phenomenon of M. Matteucci, this physicist will have discovered one of the most important properties of muscle . . . (15, pp. 342-343).

Unfortunately, further experimentation by Matteucci himself failed to give the unequivocal results he had hoped to find; most particularly he seems to have been confused by the use of liquid and semisolid insulators which at times failed to suppress the rheoscopic response, perhaps because of simple technical errors. For this reason, Matteucci continued, some ten years later, to have doubts about the electrical identity of the factors responsible for the rheoscopic response, and in 1847, he somewhat disappointedly concluded that

notwithstanding these first suppositions, which we made in hope of being able to formulate a simple explanation of induced contraction, and at the same time a demonstration of the existence of a very important fact respecting muscular contraction, we are now compelled to abandon entirely this view, since it is disproved by experiment.

From all this, it appears, that there is no experimental evidence in favour of the phenomenon of induced contraction, by the assumption of the development of electricity during muscular contraction (16, pp. 317, 319).

Now Matteucci also began to doubt his earlier results with the galvanometer during tetanus. Preparing a muscular pile, and allowing the galvanometer deflection to stabilize, he

rapidly touch(ed) the lumbar plexus of the elements of the pile with a concentrated solution of potash; excepting the two last, lest the solution should reach the liquid in which the extremities of the galvanometer are plunged. The muscular contractions become manifest after the application of the alkali, and continued for some instants, without scarcely ever being sufficiently strong to destroy the contact, by separating the elements from each other. *During these contractions, if the experiment be made without any interruption or change in the circuit, the needle of the galvanometer undergoes no variation.*

We therefore conclude; that direct experiment replies negatively to the questiou

which we put whether there was a development of electricity during muscular contraction (16, pp. 298-299).

Finally, three years later he came again to be convinced of the existence of "an electrical phenomenon developed in the act of contraction" which demonstrates "the production of an electrical *disequilibrium* in the act of muscular contraction" (17, pp. 648-649).

Du Bois-Reymond and the Nerve and Muscle Current

In the spring of 1841 the great German physiologist Johannes Mueller asked his pupil, Emil du Bois-Reymond,[15] to start an investigation of animal electricity. Mueller's interest had been aroused by reading Matteucci's "Essai sur les phénomènes électriques des animaux" which had appeared in Paris the year before. Matteucci had sent a copy to his friend and benefactor Baron von Humboldt,[16] whose own *Versuche über die gereiste Muskel*—und—*Nervenfaser* was an earlier landmark in electrophysiology. This very copy von Humboldt at once sent to Mueller, who placed it in du Bois-Reymond's hands. The study of animal electricity, thus begun, was to occupy du Bois-Reymond uninterruptedly for the next forty years. First spending nearly a whole year in an exhaustive survey of virtually the entire literature of electrophysiology,[17] du Bois-Reymond began his experimental work much as had Nobili, by preparing a galvanometer of increased sensitivity; his consisted of 4650 windings and contained a kilometer of wire.

With the new galvanometer, du Bois-Reymond confirmed Matteucci's claim that the current arose in muscle; indeed each part of a muscle was found to generate current, and du Bois-Reymond was able to detect its

[15] *Du Bois-Reymond, Emil (1818-1896).* The father of modern electrophysiology, who devoted his entire working life to this one subject. A pupil of Johannes Mueller, and his successor in the chair of physiology at Berlin, he was also active in university affairs and teaching, and a student of the philosophy and history of science. He was the permanent secretary of the Academy of Science in Berlin from 1867.

[16] *von Humboldt, Friedrich Heinrich Alexander, Freiherr (1769-1859).* A universal genius of science, brother of Karl Wilhelm, one of Germany's most learned and influential statesmen, he was widely travelled, and friend and intimate of scientists everywhere. He was the Nestor of natural science in Germany and, in hardly a lesser extent, throughout Europe.

[17] "For my part, I can say that there is scarcely a single line, not only of Signor Matteucci's almost innumerable memoirs on animal electricity, published in English, French, and Italian journals, but even of the whole literature of electro-physiology, which I have not carefully perused, scrupulously weighed, and at least faithfully noted at its exact worth in my German work" (from du Bois-Reymond's polemic, *On Signor Carlo Matteucci's Letter*, etc., see above, note 11).

presence in pieces so very small that they could be examined microscopically to count the number of muscle fibers (18).

Moreover, he pointed out,

a piece of N. ischiadicus of the frog or from guinea pigs follows electromotively the same law as a piece of muscle. If the indifferent conductors [18] touch two points on the exterior surface of the nerve, or its two ends, no current is perceivable, but it appears, and in the same direction, although much weaker, as at the edges of muscle, when the indifferent conducting arc places a point on the outside of the nerve in connection with a point on its cross-section. Thus the inner surface of a nerve, like that of the muscle, is apparently negative to the part distant from the axis (18, p. 7).

Having recourse to the analogy of the galvanic current, du Bois-Reymond made his first attempt at an explanation of nerve and muscle currents in terms of the maintenance of a resting difference of potential between the outside and inside of the fiber. To be sure, Galvani had earlier equated the muscle to a charged Leyden jar, writing that "If one admits these conclusions, then perhaps the hypothesis is not absurd and wholly speculative which compares a muscle fibre to something not unlike a small Leyden jar, or to some other similar electrical body charged with a two-fold and opposite electricity" (19, p. 74), but the ingenious analogy offered by du Bois-Reymond seems to be the immediate basis of our present "membrane" doctrine.

If one imagines a copper cylinder (he theorized) left red [19] at the bases, but zinc plated on the outside, one has at once a clear picture of the muscle fiber, positive on the outer surfaces with respect to the cross-section. In fact, if two corresponding points on the outer surface are brought in contact with the ends of our indifferent conducting circuit, the equilibrium of the current-testing apparatus is undisturbed; the same is true when the points that are touched correspond to the moist conductor of the bases which have remained red. The equilibrium will on the contrary appear disturbed immediately if the one point is moved across the zinc-copper boundary out into the fluid zone corresponding to the dissimilar metal.

It follows from this, that when both points are placed right at this junction, either both over copper or both over zinc, the very smallest displacement of the one or the other, will be sufficient to produce a current in the conducting circuit connected to them, now in this and now in that direction (18, p. 9).

The entire muscle, he conceived as a bundle of these cylinders, lying in a fluid medium, but insulated in some manner from each other. The

[18] Indifferent conductors: electrodes and leads which do not contribute current themselves, or alter the muscle or nerve current, hence inert and non-polarizable.

[19] "Red," i. e., unplated and hence showing the red, bare copper. This would correspond to the cross-section of the muscle or nerve fiber.

complications introduced by their anatomical organization made it almost impossible to deduce from single muscle potentials the potential of the entire frog, and to determine why the "frog current" had its particular orientation from head to feet. "The persistence of the current in the frog,"[20] he wrote, "apparently to find its way to the cerebrospinal axis, originally so wonderful to encounter, can after all this appear to be nothing more than an illusory accident" (18, p. 12).

The muscle current du Bois-Reymond envisioned as being established in the living organism by the action of oxidation at the surface of the muscle fiber. Calling attention to the observation that when carbon is oxidized its surface becomes electronegative to the surrounding carbon dioxide, he suggested that carbon cylinder, oxidized in a fluid containing oxygen, would become negative to the surrounding fluid as carbon dioxide was generated. "If one assumes that the change of oxygen to carbon dioxide in tissues only takes place at the surface of the cells out of which it is composed" such conclusions would be possible, and all living cells, supplied with a constant supply of oxygen from the blood and continuously giving off carbon dioxide, should maintain a difference of potential between a relatively negative interior and a positive outer surface (18, p. 22).

At this time du Bois-Reymond shared the universal belief in the existence of a "frog current," in an undamaged frog, and he was convinced also of the presence of a "muscle current" detectable between the outside of an uninjured muscle and its tendon, erroneous as this now appears to be. This led du Bois-Reymond to postulate that the tendon was a "natural" cross-section in contrast to the "artificial" cross-section made by cutting, giving direct access to a relatively negative interior of all normal muscles. This belief imposed almost endless difficulties in explaining the action currents in the intact human; for example it was for a time argued that the current appearing when an arm is contracted originates in the relaxed side (20). Nevertheless this belief, erroneous as it may seem, can only have favored the formulation of the theory of a "resting" or "pre-existing" potential.

Although du Bois-Reymond later noticed that the "muscle current" may be much smaller than that derived from the artificial cross-section produced by injury (21), it was Hermann[21] who demonstrated the

[20] The "frog current" undoubtedly arose from the injury current produced by decapitation.

[21] *Hermann, Ludimar (1838-1914)*. German physiologist who held chairs in physiology in Zurich and Koenigsberg. His textbook of human physiology went through thir-

virtual absence of potential difference between points chosen at random over the surface of a carefully dissected muscle, including its tendon (22). This suggested to him that there was no pre-existing current in a normal resting muscle, and that potentials arose only at the interface between injured and normal tissue. Describing these experiments he wrote:

> Nevertheless, the more precautions I took to avoid all damage, the weaker the currents became, so that I was finally forced to the conviction that even exposed gastrocnemii are currentless when all damage is avoided; exposure itself can at the most have an extremely weak effect (22, p. 35).
>
> The supposition is thereby justified that a still more careful preparation, and the avoidance of any still unknown source of damage, would lead to finding the gastrocnemius completely currentless (22, p. 37). The question of the pre-existence of the muscle current seems to me to be permanently disposed of by these experiments. When an isolated gastrocnemius is regularly as good as currentless, there remains no ground to ascribe to the muscles of the entire undamaged body any electromotor activity at rest, even if its absence had not already been demonstrated satisfactorily by the experiments with skin damage (22, p. 38).

The terms "injury current" and "demarcation current" are Hermann's, and verbalize his belief in the absence of a resting potential and the appearance of current only at the demarcation between normal and injured tissue (23). His also is the concept of the source of the action current from a close dipole developed across the boundary between active and resting tissue, which has descended to present times in the "dipole" theory of Craib, the theory of "limited potential differences" of Lewis, and other variants in electrocardiographic interpretation.

Bernstein's discussion of this issue in a later statement of the modern membrane theory shows how this same evidence was viewed by the adherents of the doctrine of pre-existence:

> L. Hermann demonstrated that a muscle removed from a living animal with the greatest care, appears nearly currentless when one leads off from the longitudinal surface and from the tendon. It follows from this that the undamaged muscle fiber, when it is in a uniform physiological state over its whole surface up to the tendon ends, must appear to be currentless on the outside. So soon, however, as the physiological state changes in any place, potential differences develop. This explains why a muscle from a well-cooled animal is usually currentless, because at the low temperature the metabolism of all organs is greatly reduced, and as a result, in the muscle, the physiological condition is almost completely the same throughout the entire organ. In normally nourished animals at a higher temperature such an equality of condition is almost never completely present in all parts of

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teen editions between 1863 and 1904. He contributed to experimental toxicology and muscle and nerve physiology. He was leader of the opposition to the "membrane theory."

a muscle, and thereby we almost regularly see weak potential differences appearing after removal of the skin and recording from the muscle from longitudinal surface and tendon end, and also from other points. Since one can neglect in further discussion these weak currents of an essentially normal and undamaged muscle, which frequently is affected by accidental minor lesions as pinching, pressure, etc., we represent as currentless the undamaged muscle fiber in the ideal circumstances of uniform conditions throughout its entire extent, as is to be concluded from the investigations of L. Hermann (23, 24, pp. 8-9).

The Negative Variation [22]

Having satisfied himself of the existence of a polarized state in the nerve and muscle fiber, du Bois-Reymond turned his attention to Matteucci's demonstration of a disappearance of the muscle current during tetanus, reporting as follows:

Matteucci has pointed out in his "Essai sur les phénomènes électriques des animaux," Paris, 1840, p. 81 & 82, that the frog current disappears in tetanus. I have most thoroughly convinced myself by a great number of the most careful experiments, in which I employed frog gastrocnemii prepared in the manner described in paragraph 18, which I stimulated via the nerve according to Nobili's directions (Ann. de Chim. et de phys. 44, p. 89) using the method of compensation [23] that in fact, during strong and long-lasting contraction the current far from disappears, but only diminishes markedly in intensity. I have confirmed this by the uncertain methods used by Matteucci of setting the whole frog into tetanus by strychnine, and the galvanic preparation by rapid dissection. . . . How the nerve current behaves when nervous activity is aroused, remains for investigation (18, pp. 12-13).

The diminution of the muscle current in tetanus may perhaps be explained thus; that the whole mass of muscle forms shunts for the current of a single primitive muscle bundle, but this mass increases in cross-section and diminishes in length during tetanus and hence decreases in resistance, therefore the current in the conducting arc must decrease in intensity. It would be objected, on the contrary, that this change in resistance in a tetanus of the entire limb is too small to be considered. Experiments to measure it are impossible. During strong and enduring

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[22] "Instead of '*decrease*' I usually say 'negative variation' of the muscular current during contraction, because as yet I have not been able to make out whether during contraction there is only a decrease in the intensity of the current, or whether the direction of the current is reversed." (Du Bois-Reymond, E. *On Signor Carlo Matteucci's Letter*, etc., see above, note 11.)

[23] The injury current was balanced out, or "compensated" for, by passing current from a wet cell through the galvanometer in the opposite direction to the muscle or nerve current. The compensating current was adjusted by a suitable potential divider until the galvanometer was brought back to zero. In this case balance was achieved by means of the "rheochord," a single length of resistance wire laid out along a meter-stick on which a sliding contact could be made at measured distances.)

contractions of the arm, shoulder and pectoral muscles of the human body the resistance undergoes no appreciable change[24] (18, p. 19).

Just as Matteucci had demonstrated the presence of an injury current in man, so du Bois-Reymond called attention to electrical changes accompanying muscular contraction in man (25, 26, 27). The following virtually literal translation soon appeared in the *Philosophical Magazine* (28, pp. 543-545); it is the first demonstration of myoelectric potentials in man.

He (Du Bois-Reymond) takes a very sensitive galvanometer, and attaches to the terminal wires thereof two perfectly homogeneous strips of platina. These strips are dipped down into two vessels filled with salt and water, into which fluid, as contained in each vessel, two corresponding fingers of the two hands are to be plunged. On the first immersion of the fingers there is almost always observable a more or less decided deflection of the needle, this deflection not being amenable to any known law, and being in the opinion of the experimenter due to the difference existing to some extent and in some way or another between the cutaneous covering of the two fingers. Whenever there is a wound on one of the fingers the deflection is greater than usual; and its direction is uniformly such that the injured finger behaves like the zinc-side of an arc of zinc and copper, which we may conceive to be inserted between the two vessels instead of the human body. It need hardly be remarked, that it is not this sort of action to which in the experiment in question it is purposed to direct the attention. On the contrary, in order to observe the effects alluded to, it is requisite to wait either till the needle has gone back to the zero-point of its scale, or at least until it has assumed a constant deflection attributable to the residue of a current which it is beyond us to eliminate. As soon as this state is attained, the whole of the muscles of one of the arms must be so braced that an equilibrium may be established between the flexors and the extensors of all the articulations of the limb, pretty much as in a gymnastic school is usually done when one wants to let a person feel the development of one's muscles.

As soon as this is done the needle is thrown into movement, its deflection being uniformly in such a sense as to indicate in the braced arm "an inverse current," according to Nobili's nomenclature; that is to say, a current passing from the hand to the shoulder. The braced arm then acts the part of the copper in the compound arc of zinc and copper mentioned above.

Du Bois-Reymond, no less than Matteucci, had frequent recourse to the rheoscopic frog, but he did so with a clearer appreciation of the relative values of galvanometer and rheoscopic frog which in many ways was derived from Nobili's attempt to assess their relative merits. He also had learned from Nobili something of the nature of tetanus as an intermittent excitation producing a fused contraction, and the manner in which nerve

[24] It is now recognized that the electrical impedance of a fiber decreases considerably as the impulse passes.

responded to current. Nobili had written describing the convulsions exhibited by active frogs after preparation that

> These convulsions last for a long time; contractions on the contrary ordinarily cease in an instant. I say ordinarily, because there is a way of rendering them permanent, to the point of reproducing all the effects of natural tetanus. It suffices for this to interrupt and reestablish the circuit rapidly enough so that the contraction which arises from a given contact does not disappear before the production of that which is due to the following contact. Thus the frog has not the time to relax from one contraction to another, and its members stay stretched out and rigid as in the case of natural tetanus (2, p. 90).

Du Bois-Reymond wrote expressing his understanding of the production of tetanus, that "This law teaches the way in which a continuous contraction, a veritable tetanus of muscle, can be obtained by means of the electric current. For this one has only to maintain the density of current in the nerve in continual oscillations, such that the derivative of the equation of the curve of densities is zero only in the instants when it changes sign. Evidently then the irritation will be continuous. The continuous irritation will be as great as possible when one gives to the curve of its densities the form of a comb" (29, p. 181).

Analysing then the relative merits of the galvanometer and rheoscopic frog as current detectors, and understanding as he did the nature of tetanus, du Bois-Reymond now perceived the significance of the secondary contractions of the rheoscopic frog when its nerve was placed across an active muscle.

> The galvanometer, in truth (he wrote) is an instrument eminently adapted to detect the presence of continuous electric currents, as well as the variations of the intensity of these currents when these variations last a sufficiently long time in comparison with an oscillation of the needle. But if it is a question of instantaneous currents, or even of variations in the intensity of continuous currents, that are extremely short with respect to the duration of an oscillation (of the galvanometer), when these variations take place singly or are repeated continuously at more or less short intervals, the galvanometer then ceases to be of value. In fact, the inertia of the needle permits it only to perceive the sum of all the electrodynamic actions exerted during the passage of the current, and prevents it from following in its movements the rapid changes that one can impress, in one direction or another, upon the intensity curve. The galvanometer, in this case, no longer is capable of faithful indication of what occurs at every instant in the circuit of which it is a part, and instantaneous currents, if not very strong, traverse it without creating easily appreciable effects.
>
> Now it results from the law of nervous stimulation by current, that the frog as a rheoscopic medium, far from participating in these inconveniences of the galvanometer, ought to enjoy, on the contrary, the inverse properties, such as to be able

to fill, in the study of currents, the lacunae which were left by the electromagnetic rheoscope (i. e., the galvanometer as opposed to the physiological rheoscope). The frog is incapable, by this fact, of revealing the presence of currents of a constant intensity, or indeed of detecting slow variations of continuous currents. But as soon as these variations take place with a certain speed, and as they by the same token begin to elude the galvanometer, the frog then enters into activity, and its indications acquire all the more energy as the variations become more abrupt. For the same reason instantaneous currents evoke the strongest contractions in the frog, while leaving in repose, at least apparently the most mobile astatic system. To make quite clear this capital difference between the galvanometer and the frog, I will recall that a series of instantaneous currents of equal intensities, but of opposite directions, leave the index of the galvanometer at zero, while the frog is tetanized by the same currents. Consequently if it is hardly useful to wish to substitute the frog for the galvanometer in the study of the presence, the direction, and the intensity of continuous currents, it is all the more justifiable to have recourse to it to discover the presence of weak instantaneous currents, and rapid variations of continuous currents of weak intensity.

Let us apply these principles to the study of the electric phenomenon, which, according to my studies, accompanies muscular contraction. In making use only of the galvanometer, this phenomenon seems to us to consist of a proportional reduction of all the ordinates of the intensity curve of the muscular current, a reduction that would persist as long as the tetanus lasted. As to what happens in the circuit at the moment of a single contraction, we have not yet been able to determine by experiment.

Let one imagine now in the circuit of the galvanometer a muscle disposed in a manner to be able to be set into contraction by stimulating its motor nerve. Let us open the circuit and introduce there at any place, the nerve of a rheoscopic frog. It then presents, on causing the contraction of the first muscle, a phenomenon well worthy of attention. At each contraction of this muscle, the rheoscopic frog contracts also. But, what was easy to predict, contraction did not take place unless the muscle is placed in the circuit in such a way that one of the two terminals of the galvanometer was applied to the longitudinal surface, either natural or artificial, of the muscle. This is the proof that the contractions of the rheoscopic frog are derived, in fact, from variations in intensity of the muscular current of the muscle stimulated directly, at the moment of its contraction. These variations being proportional to the relative size of the ordinates of the curve of intensity of the muscular current, they do not acquire the amplitude sufficient to convulse the rheoscopic frog except in the neighborhood of the maximum of the curve.

Here, then, is the modification of the muscular current by the effect of the contraction rendered appreciable even in a single contraction, however fugitive it is, by the aid of the rheoscopic frog. In truth, this technique teaches us nothing relative to the sign of the variation in intensity of the current, but there should remain no doubts in this regard, after our earlier observations made with the galvanometer.

Now one might expect that in tetanizing the muscle subject to direct stimulation, the rheoscopic frog would present only two contractions, the one at the beginning, the other at the end of the tetanus, that is to say, at the instant that the muscular current undergoes the reduction in its amplitude, and at the moment it regains its

earlier amplitude. However, what one observes is indeed more interesting. In fact, as soon as the first muscle enters upon tetanus, one sees the rheoscopic frog equally seized by tetanus, and persist in it as long as the tetanus lasts in the muscle stimulated directly. This proves that taking time for the abscissa, and the intensities of the muscular current at each instant for the ordinate, the curve of the intensities does not undergo continuous change during the tetanus, but that this curve takes the form of a comb. Paying attention simultaneously to what transpires on the galvanometer, one sees the needle gain zero and oscillate on the other side of this point, as I said in my preceeding note. One ought to conclude from this that the teeth of this pectiniform curve are directed toward the abscissa, and, remarkably indeed, this phenomenon is not produced only when the direct tetanus is of electrical origin, that is to say that it is derived itself from a pectiniform curve of current densities in the stimulated nerve, but the secondary tetanus is seen also even when the source of the direct stimulation does not seem to be intermittent, as in the case of intoxication with strychnine. . . .

It results finally from what I have just said that one cannot, without other procedures, determine if at the instant of contraction, the ordinates of the curve of intensities of the muscular current related to time undergo simply a reduction of their amplitude, if they disappear completely, or indeed if they change sign; in other terms, if the teeth of the pectiniform curve reach the abscissa or not, or even if they descend below it. In fact, the rheoscopic frog indicates nothing of this subject, and the galvanometer, measuring only the sum of the electrodynamic actions, is equally poorly adapted to decide among these different possibilities (*29*, pp. 182-186).

In a later discussion of this problem in the first volume of his *Thierische Elektricität*, du Bois-Reymond acknowledged most clearly, as was his custom, his debt to earlier workers who had studied the characteristics of galvanometers and made ingenious experiments to compensate for their lack of direct evidence. One of these was Pouillet,[25] whose work (30) will be discussed more appropriately later on. The other was Dove,[26] who arranged two identical primary coils in a series so that they were identically activated (31). Two secondaries, also identical, were arranged to oppose each other in series, and could be connected to a galvanometer or

[25] *Pouillet, Claude Servais Mathias* (*1790-1868*). French physicist who was successively Professor of Physics at the Ecole Polytechnique, and in the Faculty of Science, and Director of the National Conservatory of Arts and Crafts. A Member of the Chamber of Deputies, he participated in legislation concerning science and industry, railroads, telegraphs, and the coinage and postal systems. An elegant and clear lecturer, an ingenious and skillful experimenter, he was known universally for a famous textbook of physics and meteorology.

[26] *Dove, Heinrich, Wilhelm* (*1803-1879*). German physicist who made many contributions to optics, electricity, and weights and measures, but whose major contributions were to scientific meteorology, of which he may be considered one of the founders. He became the Director of the Royal Meteorological Institute in Berlin in 1848. Carl Ludwig's daughter married Dove's son Alfred Wilhelm, a well-known historian and man of letters.

to the human skin for testing sensation. When they were activated by an interrupter, the secondary currents antagonized each other both galvanometrically and sensationally. When a solid iron coil was inserted into one primary, imbalance was created in the outputs from the two secondaries, sensation was evoked, and the galvanometer deflected. Lengths of iron wire were now inserted in the second primary coil until galvanometric balance was achieved. Shocks could still be felt, however. It was apparent that at this point the total quantity of electricity in the two circuits was the same, so that the opposing electrical pulses reaching the slow-moving galvanometer equalized each other. The intensities and durations of the two induced currents must have differed, however, so that although the products of their intensities and durations were equal, and hence their galvanometric effects balanced, their differential intensities left a peak voltage which was able to stimulate sensory endings.

(To be Concluded)

JEFFERSON ON THE MEDICAL THEORY AND PRACTICE OF HIS DAY *

COURTNEY R. HALL

Thomas Jefferson, probably the best-informed and most versatile of our presidents, is fairly credited with important achievements in the fields of education, science, and the arts, in addition to his better-known activities in politics and diplomacy. Historians of science have called attention to the important part played by our third president in the development of paleontology, scientific agriculture, and mechanical invention.[1] His many important contacts with scientific men in Europe and the New World, carried on in his large correspondence, make it clear that he was aware of the principal trends of scientific thought. The large proportion of scientific books in his private library, which he built to more than 6,000 volumes, reflect a deep interest in that area of human knowledge.[2]

Such a man was well-suited by inclination and opportunity to make known, sooner or later, his opinions concerning medicine and its position among the various applications of science. His concern for the welfare of humanity, and particularly for the physical well-being of the American people, led him to speculate upon the most healthful climate and environment for human habitation, and also upon the measures which were being taken to protect humans from the ravages of disease.

* Paper read at the twenty-ninth annual meeting of the American Association of the History of Medicine, Durham, N. C., April 21, 1956.

[1] See for example: E. T. Martin: *Thomas Jefferson*, Scientist, New York, 1952; C. A. Browne: "Thomas Jefferson and the Scientific Trends of his Time," *Chronica Botanica, 8*, No. 4, Waltham, Mass., 1944; A. H. Clark: "Jefferson and Science," *Jour. Wash. Acad. Sci., 33*, No. 7, Washington, 1943; F. E. Brasch: "Jefferson as a Man of Science," *Science, 97*, 300-01, 1943. C. A. Browne lists over fifty books and papers which deal with Jefferson's influence on various physical and applied sciences. His most important work of scientific kind was his *Notes on the State of Virginia*, which contained many data on the natural history of that area. The bulk of his scientific correspondence is scattered throughout his writings, of which the most useful are those edited by Paul Leichester Ford (10 volumes, 1892-97) and Albert E. Bergh (20 volumes, Washington, 1904-05). The large edition in progress (ed. by Julian Boyd et al.) has not progressed to a point useful for scientific data.

[2] E. M. Sowerby, comp: *Catalogue of the Library of Thomas Jefferson*, 4 volumes, Washington, 1952-55. About one-third of the volumes which have survived are in the scientific division.

At the basis of Jefferson's thinking, stimulated by extensive study and wide experience, lay certain assumptions concerning man and his world which we sometimes designate by such terms as "Jeffersonian philosophy" or "Jeffersonianism." His faith in rational man and his convictions about the institutions needed to establish a rational world were strengthened by his implication in strategic situations in our own Revolution. Later, when he arrived in France, he was accepted cordially as the successor of the beloved Franklin, and was soon caught up in the intellectual life of Paris, as events moved swiftly toward the turmoil of the French Revolution. With Lafayette, Chastellux and Barbé-Marbois he renewed friendships already formed at home. Condorcet and La Rochefoucauld became his friends. Through the good offices of Franklin he came to know and revere Madame Helvetius; at her salon in d'Auteuil he met the leading *Idéologues*, among them the Abbé Morellet, who was later to translate his *Notes on the State of Virginia*; the economist J. B. Say; the historian Volney, the political theorist Destutt de Tracy, the medical theorist Pierre Cabanis, and others.[3]

Idéologie, termed a "substantiation of a philosophic position in the revolutionary movement," [4] was formulated in the middle of the eighteenth century by the Abbé de Condillac, and augmented materially by Pierre J.-G. Cabanis and Destutt de Tracy about the turn of the next century. Ideologic thought, says its principal historian, "ascribed all ideas and all the faculties of human understanding to sensation. In order to test the validity of an idea, therefore, it is necessary to analyze it into its component sensations which initially come into the mind from the outside world, and refer each sensation back to its source in nature." This assumption, and others which followed from it, all indicative of the strong influence of Bacon and Locke on French revolutionary thinking, had considerable vogue during the period. Its followers undertook an elaborate revamping of traditional beliefs in religion, politics, economics, and science. Having obtained key positions in the Directory and Consular governments, and having attained in many cases memberships in the Institute of France, they exerted for a time an impressive influence on the direction of thought in France.[5] Cabanis undertook a sweeping reorganization of medical education; Philippe Pinel laid the foundations of modern psy-

[3] Gilbert Chinard: *Jefferson et les Idéologues*, Baltimore, 1925, ch. 1.

[4] C. H. Van Duzer: *Contributions of the Idéologues to French Revolutionary Thought*, Baltimore, 1935, 15.

[5] C. H. Van Duzer, *op. cit.*, 16-17.

chiatry; Xavier Bichat made impressive contributions to pathological anatomy.[6]

It is certain that Jefferson became greatly interested in the intellectual approach of the *Idéologues*. He carried on considerable correspondence with several of them, including Cabanis, de Tracy, and Volney, after his return to the United States. He translated and sponsored American editions of several of their original works.[7]

Dr. George Rosen called attention to the interchange of ideas between Jefferson and the *Idéologues* in a paper read before this Association in 1951. He analyzed therein the strong convictions of both the Jeffersonians and the French group that a liberal political system probably ensured a high level of public health.[8] Surely such a correlation was good Jeffersonian philosophy, as it was a firm belief of the revolutionary philosophers of France. Since the present inquiry concerns only Jefferson's views of the medical profession, it is necessary to inquire whether his thinking was influenced directly by the French thinkers, as one of a number of bases for his opinions.

Since Pierre Cabanis was the only physician of the Ideologic school who was a personal friend of Jefferson, it is important to know something of the intellectual contacts of the two men. On October 20, 1802, Cabanis sent the President his two-volume work: *Rapports du Physique et du Morale de l'Homme*, which had just been published in Paris.[9] In this study, Cabanis maintained that the flesh and the spirit were not two essentially separate spheres of man's nature but were so united that only through a study of the physical constitution of man could his spiritual and moral attributes be ascertained, a position which by its emphasis on the empirical study of man made unnecessary any reference to revelation or ecclesiastical authority.[10] This work, with such important implications to physiology and psychology, impressed Jefferson deeply, as he indi-

[6] R. H. Shryock: *The Development of Modern Medicine*, New York, 1947, 152-53. The author comments fully upon the influence of the *Idéologues* upon modern medicine. In describing the process by which they applied the philosophic empiricism of Locke to medical studies, he states that the *Ideologues* Cabanis and Pinel believed that clinical data could be analyzed by tracing them back to their sources in specific organs.

[7] Jefferson translated de Tracy's *Commentaire sur Montesquieu* and Volney's *Les Ruines*. He arranged for the publication in Georgetown, D. C., of a work on political economy by de Tracy.

[8] George Rosen: "Political Order and Human Health in Jeffersonian Thought," *Bull. Hist. Med.*, *26*, 32-44, 1952.

[9] P.-J.-G. Cabanis to Jefferson, Oct. 20, 1802, quoted in Chinard, *op. cit.*, 23.

[10] C. H. Van Duzer, *op. cit.*, 59.

cated in his note of acknowledgment to the author;[11] nine years later, in a letter to Dr. Thomas Cooper, he termed it "the most profound of all human compositions."[12] It pleased Jefferson, many years later, to receive from Lafayette a new work which seemed to him to establish conclusively the accuracy of many of Cabanis' ideas. He wrote to Lafayette enthusiastically:

> I have never been more gratified by the reading of a book than by that of Flourens which you were so kind as to send me. Cabanis had gone far towards proving from the anatomical structure and action of the human machine that certain parts of it were probably the organs of thought and consequently that matter might exercise that faculty. Flourens proves that it does exercise it, and that deprived of the cerebrum particularly the animal loses all senses, all intellect, and memory, yet lives in health and for indefinite terms.[13]

In 1805, a little over two years after Jefferson had first seen Cabanis' work on the physical and moral nature of man, he wrote Count Volney, whose account of the climate and soil of the United States had met with Jefferson's approval: "I am glad to hear that M. Cabanis is engaged in writing on the reformation of medicine. It needs the hands of a reformer, and cannot be in better hands than his."[14] In 1807, Jefferson purchased Cabanis' new study on the reform of medicine, and another shorter study by the same author: *Du Degré de Certitude de la Médecine*, from the French booksellers P. and C. Roche in Philadelphia, and placed them in the growing medical section of his library.[15]

Jefferson's interest in the medical ideas and practices of his time was not an obsession, yet his references to medicine and allied subjects occur fairly frequently among his letters. His reputation as a philosopher and a man of science placed him in a somewhat difficult position. He received all sorts of inquiries regarding human health in general and his own health in particular. His opinions of certain physicians were asked. Others wished to know the causes of certain diseases. Young physicians sent him copies of their inaugural dissertations, and medical professors presented him with copies of their medical lectures. His comments were sought eagerly, and were given freely, drawn sometimes from his personal experience and sometimes from his conversations with medical men or from his

[11] Jefferson to P.-J.-G. Cabanis, July 12, 1803, quoted in Chinard, *op. cit.*, 25.

[12] Jefferson to Thomas Cooper, July 10, 1812, *Writings* (ed. Bergh), XIII, 177.

[13] Jefferson to Lafayette, Jan. 26, 1825, quoted in *Chinard*, *op. cit.*, 279; the work referred to is by P.-J.-M. Flourens on the nervous system of vertebrates.

[14] Jefferson to Count Volney, Feb. 8, 1805, quoted in E. M. Sowerby, *op. cit.*, I, 396.

[15] E. M. Sowerby, *op. cit.*, 395.

perusal of their medical papers. Two characteristics of Jefferson's thinking led him to make some rather sharp criticisms of the medical thought of his time. The first of these mental traits was his firm belief in observation and experiment as *sine qua non* conditions for any scientific inquiry. This was illustrated in his many careful agricultural and mechanical experiments, his field work in paleontology, his arrangement of tabular data regarding weather and climate, and in other ways. Another firm belief which underlay much of his thinking was in the practical utility of a method or an idea as a test of its value. Science should contribute to human welfare to be worthy of the thought of men, he once said. These basic criteria, the first descriptive of his scientific method, and the other defining what was to him the true objective of all science, suggest both his excellence and possibly his limitations as a scientist. Certainly he was led to make sweeping statements at times, in assuming that medical practice, to be helpful, must square with his basic criteria.

In a letter to Dr. Casper Wistar, Professor in the Medical College in Philadelphia, Jefferson contended that because of the infinitely diversified nature of symptoms, physicians could rarely establish a definite disease, and that to an unknown disease there could hardly be a known remedy. He urged therefore that

> having been so often a witness to the salutary efforts which nature makes to re-establish the disordered functions, he (the physician) should rather trust to their action than to hazard an interruption of that, and a greater derangement of the system, by conjectural experiments on a machine so complicated and so unknown as the human body. . . . But the adventurous physician goes on, and substitutes presumption for knowledge. . . . He establishes for his guide some fanciful theory of corpuscular attraction, of chemical agency, of mechanical powers, of stimuli, of irritability accumulated or exhausted, of depletion by the lancet or repletion by mercury, or some other ingenious dream, which lets him into nature's secrets at short hand. On the principles which he thus assumes, he forms his table of nosology, arrays his diseases into families and extends his curative treatment, by analogy, to all the cases which he has thus arbitrarily marshaled together. I have lived to see the disciples of Hoffman, Boerhaave, Stahl, Cullen, Brown, succeed one another like the shifting figures of a magic lantern. . . . It is in this part of medicine that I wish to see a reform, an abandonment of hypothesis for sober facts, the first degree of value set on clinical observation, and the lowest on visionary theories. . . . The only sure foundations of medicine are, an intimate knowledge of the human body, and observations of the effects of medical substances on that. The anatomical and clinical schools, therefore, are those in which the young physician should be formed.[16]

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[16] Jefferson to Wistar, June 21, 1807, *Writings* (ed. Ford), IX, 78-85.

The Wistar letter, of which excerpts have been quoted, is the longest and most detailed of Jefferson's criticisms of the medical profession. It is interesting to note that he wrote the letter only a few weeks after securing copies of two of Cabanis' books: the one on the degree of certainty of medicine,[17] and that on the reform of medicine.[18] It is also suggestive that there is a certain similarity in Jefferson's parade of the various theoretical schools to Cabanis' analysis of the way in which the historical schools of medicine replaced one another; this appeared in his essay on medical certainty.[19] The President may have been stimulated to pen his blast at the doctors by an examination of the new additions to his library. Jefferson wrote a number of letters in about the same vein.

Among Jefferson's closest friends, was Dr. Benjamin Rush, with whom he often disagreed sharply on medical matters,[20] but whom he always addressed in the most friendly manner. In one letter to Rush, Jefferson went over much the same ground as he had to Wistar. Here again was approval of treatments which he regarded as undoubtedly helpful: "Kinkina [sic] in Intermittent, Mercury in Syphilis, Castor Oil in Dysentery, etc." and the familiar disapproval of medical intereference in cases where no such specifics were known. He was prompted to write Rush at this time because a young student had just appealed to both men for financial aid to enable him to pursue a course in veterinary medicine in London. This gave Jefferson a chance to speak his mind upon veterinary medicine, which he proceeded to do. While he admitted that the young man might learn something if he went to school in Paris instead of London, Jefferson felt that the entire system of veterinary instruction was practically worthless, since animals, by their very nature, could never be cooperative patients. He was even moved, in this letter, to compare the low state of the veterinary art to the efforts of a Virginia physician, Dr. Seymour, to employ his medical skill to cure the ailments of his tobacco plants: "He bled some, administered lotions to others, sprinkled powders on a third class, and so on—they only withered and perished the faster."[21]

[17] *Du Degré de Certitude de la Médecine* was first published in France in 1797; Jefferson's copy was the 1803 edition; an American edition appeared in Philadelphia in 1823 under the title: *Essay on the Certainty of Medicine.*

[18] *Coup d'Oeil sur les Révolutions et sur la Réforme de la Médecine* appeared first in Paris in 1804. An English edition was published in London in 1806 under the title: *Revolutions of Medical Science and Views Relating to Its Reform.*

[19] P.-G.-J. Cabanis: *Essay on the Certitude of Medicine*, Philadelphia, 1823, 33-38.

[20] For the "well-meaning harm" which Rush had done, in his medical treatments, see Jefferson to Thomas Cooper, Oct. 7, 1814, *Writings* (ed. Bergh), XIV, 200.

[21] Jefferson to Rush, March 6, 1813, *Writings* (ed. Bergh), XIII, 222-25.

Much as he opposed medical theories and much of the medical practice of his time, Jefferson had a wholesome respect for medical studies and believed that they should have an important place in a university curriculum. As early as 1800 he discussed with Joseph Priestley his plan for establishing an institution in Virginia which should be more central in location than the College of William and Mary, and urged, among the subjects which seemed "useful and practicable," instruction in anatomy, surgery, and medicine.[23] Fourteen years later, with the plans for the new University of Virginia almost complete, he included in them a school of medicine on the highest or professional level of instruction.[24] It is well known that when the new University was officially opened in March, 1825, a school of medicine took its place among the seven independent divisions of instruction.[24] Yet in his thinking about the medical portion of his University, of which he was the first Rector, Jefferson exhibited to the end strong antagonism to any instruction there in medical theory, which he called the "charlatanerie [sic] of the body" in a letter to Dr. Thomas Cooper in 1814.[25]

Jefferson's elaborate plan, unrealized, for a great national university in the United States, and his later more successful one, for a modern institution in Virginia, exhibit a certain parallelism to the strenuous efforts of the *Idéologues* to build a complete educational system for France, in complete harmony with the philosophy of the day. This they accomplished partially under the authority of the Law of the Third Brumaire (October 25, 1795). Actually much of the specialized writing of Cabanis and the other *Idéologues* was inspired by one of their number, Dominique-Joseph Garat, Commissioner of Public Instruction, to aid him in formulating a comprehensive plan for the improvement of all branches of education.[26]

Jefferson took no important part in the controversy over the appearance and spread of yellow fever, which raged with great violence on many occasions in the coastal cities of the United States, reaching a peak in the terrible Philadelphia epidemic of 1793, when Jefferson and most of the Federal officials fled from the city. At one time he was of the opinion that the excessive sunshine of America was responsible for the fever's prevalence. Later he inclined to the view that it arose from a chemical inhaled with the surrounding air, an opinion doubtless picked up from

[23] Jefferson to Priestley, Jan. 18, 1800, quoted in A. Koch and W. Peden: *The Life and Selected Writings of Thomas Jefferson*, New York, 1944, 552-53.
[24] Jefferson to Peter Carr, Sept. 7, 1814, quoted in Koch and Peden, *op. cit.*, 649-49.
[24] C. A. Browne, *op. cit.*, 415.
[25] Jefferson to Thomas Cooper, Oct. 7, 1814, *Writings* (ed. Bergh), XIV, 199-200.
[26] C. H. Van Duzer, *op. cit.*, ch. 4.

Dr. Samuel L. Mitchill and other medical friends. Some variety of chemical cause dominated medical thinking on the yellow fever almost to the days of Walter Reed. The celebrated scientist, von Humboldt, expanded Mitchill's theory of a single poisonous gas to a combination of five dangerous chemicals which together attacked the human system. Since the propagation of the fever was apparently by chemical means, Jefferson ventured the opinion that the chemists might be able to control its spread, at least on shipboard, by decomposing the surrounding atmosphere.[87]

It was in the early efforts to control smallpox in the United States, that Jefferson was able to render important service. An early convert to Edward Jenner's ideas, he gave powerful support to the medical men in this country who strove to promote Jennerian vaccination. In the year 1800, Dr. Benjamin Waterhouse, pioneer follower of Jenner, began the introduction of Jenner's cow-pox inoculation in and around Boston, and in other localities where he was acquainted with reputable and experienced physicians. Caution was necessary, for soon much useless and even dangerous material was being distributed as the true Jennerian vaccine. In addition, it was necessary to supervise the operation closely, and to follow, with an expert eye, the progress of the inoculation.

To use Thomas Jefferson as a sort of southern agent in his vaccination program was Waterhouse's own idea, though it is true that he had already received encouraging letters from Jefferson. While the notion was taking root, Jefferson had been elected and inaugurated President. Meanwhile many doctors, some of them in Virginia, kept writing to Waterhouse, asking him to forward to them vaccine material for use in their own communities. Since Waterhouse was not acquainted with any Virginia physicians, he decided to ask the President to assume the responsibility for seeing to it that a vaccination center was established in the South, under reputable supervision. To push his plan along, he enclosed with his letter to Jefferson some vaccine material, with directions for its use, along with a series of hand-painted plates showing the day-by-day development of the "pustule."[88]

Jefferson was glad to help, and soon handed Waterhouse's sample to a physician, as he did with second and third samples sent him from Boston, but in none of these early trials did the patients develop the "true disease." It was at this point that Jefferson made a helpful suggestion. Consulting his weather charts, he noted that those days on which the vaccine had

[87] C. A. Browne, *op. cit.*, 409-10.

[88] Waterhouse to Jefferson, June 8, 1801, in B. Waterhouse: *Prospect of Exterminating the Small Pox*, Part II, Boston, 1802, 23-29.

been in transit had been excessively hot, and that it might have been the heat which had destroyed the effectiveness of the virus. After Waterhouse adopted Jefferson's suggestion that the infected material be first enclosed in a small glass vial, and then immersed in a large one, partially filled with water, the shipments proved to be unimpaired.

Most of the events which followed have been described elsewhere and need only brief emphasis. The first successful smallpox vaccination south of New England was apparently performed on a member of Jefferson's family on August 6, 1801, by a Dr. Wardlaw. Thereafter Jefferson supplied Dr. Edward Gannt of Georgetown, D. C., with samples of the vaccine, who in turn administered the first treatments in the Federal District. The President sent other samples to Dr. John R. Coxe of Philadelphia, who introduced the treatment into that City.[29] According to Waterhouse, Jefferson was directly responsible for the introduction of vaccination into Virginia, the District of Columbia, Pennsylvania, Delaware, Maryland, and North Carolina.[30]

The vigorous correspondence carried on between Jefferson and his medical friends over the vaccination business makes interesting reading, for in it we see the rather unique situation of a President of the United States cast in the unfamiliar role of administrator of a vaccination clinic in his own and several other plantation households. His detailed descriptions of the progress of his " 200 cases " read almost like hospital reports. There was but one case of fever of long duration, he was glad to report; he remarked upon the surprisingly small number of sore arms; he was thrilled to find that the treatment was apparently successful, in all but three or four cases; he took infinite pains to determine the exact time when it was best to take material from his patients' arms in order to prepare new vaccine, and found it to be sometime during the eighth day. He even asked for, and received, from his Philadelphia correspondents, some actual smallpox infected material, with which to make final tests of the validity of the method as practiced in his area.[31]

His interest in vaccination did not stop with the completion of his neighborhood project; in various ways he endeavored to extend and popularize the practice. When a sizable group of Indians, headed by Chief Little Turtle, visited him in Washington, their White Father greeted them with an address in which he announced a new and unexpected gift

[29] Jefferson to Dr. John R. Coxe, Nov. 5, 1801, quoted in B. Waterhouse *op. cit.*, 32-34.
[30] B. Waterhouse, *op. cit.*, 35-37.
[31] Henry A. Martin: " Jefferson as a Vaccinator," *North Carolina Med. Jour.*, Jan. 1881, 28.

of the Great Spirit to all men, to help ensure their freedom from disease. Jefferson then turned the delegation over to Dr. Gannt, who vaccinated every one of them.[83] In drawing up the instructions for the western explorers Lewis and Clark, the President included therein provision for taking with them a supply of vaccine, with instructions for its use among the persons with whom they might come into contact on the way.[85] His concern for the health of the exploration party led him to arrange with Dr. Rush for the preparation of a set of health and medical instructions, which Captain Lewis was to obtain from Rush before the expedition departed.[84]

Such were some of the reactions of Jefferson to the medical theories and practices of his time. He approved heartily of remedies and treatments which medical experience had proved helpful. He never tired of praising Lettsom, Jenner, Waterhouse and all the others who had taken part in the vaccination movement, and was not a little proud of his own part in its American phase. To Jenner's nephew he wrote, with characteristic sweep: "Medicine has never before produced any single movement of such utility" [85] as Edward Jenner's achievement.

On the other hand, he disapproved strongly of medical theories, for they seemed to him unrelated to the physical facts of life. Medicine was too much devoted to theory, too little to observation and experiment. Cabanis had said: ". . . if there be a science overcharged with superfluous baggage, it is doubtless medicine, and none stands more in need of a true philosophic spirit to direct its reform." [86] With this point of view Jefferson was in absolute accord, and had, as we know, said much the same thing himself. He disapproved of Brunonian bleeding and doping [87] but had much faith in the restorative powers of the human system, more characteristic of the system of Cullen. Yet he would hardly have gone along with Cullen's injunction to his students not to allow the indications of nature observed at the bedside to sway them from theoretical consideration.[88]

[83] B. Waterhouse, *op. cit.*, 37-38.

[85] A. H. Clark, *op. cit.* (Rep. in F. C. Rosenberger, *Jefferson Reader*, New York, 1953, 149-160).

[84] George W. Corner, ed.: *The Autobiography of Benjamin Rush*, Philadelphia, 1948, 265-67.

[85] Jefferson to Rev. Dr. G. C. Jenner, May 14, 1806. Quoted in Koch and Peden, *op. cit.*, 580-81.

[86] P.-G.-J. Cabanis: *Revolutions of Medical Science and Views Relating to Its Reform*, 4.

[87] See note 21, above.

[88] C. R. Hall: *A Scientist of the Early Republic. Samuel Latham Mitchill, 1764-1831*, New York, 1934, 32.

If Jefferson and his American contemporaries seemed confused about the condition of medicine at the end of the eighteenth century, it was not surprising, for never, probably, had medical thinking in general been in so chaotic a state. On the one hand, physical science had made important strides, during the 17th and 18th centuries; factual data of immense importance to medicine had been accumulating, yet there was the widest disagreement among medical men as to the significance for them of the new concepts. Physicians, who were in many instances well-trained in physical science, were chagrined to behold the apparent order in such fields as mathematics and physics, and to realize at the same time how utterly confused medical thinking had become. The natural consequence of such a realization was the formation of many new schools and systems with the obvious intent of bringing some order into the field.[39]

Jefferson, probably as well informed as most Americans regarding the course of scientific investigation during his time, could find little sense or meaning in all this. Drawing up his own set of scientific criteria from his own quasi-professional scientific experience, he demanded that medical men use only the approved methods of physical science. So far as they seemed to be doing so, he applauded them; beyond their exact achievements, he had little use for their efforts. In other words: Jefferson, stimulated by the purely material approach of the *Idéologues*, viewed medicine as just another of the physical sciences.

The medical writer who aroused his greatest enthusiasm put it this way:

> In medicine everything, or nearly so, depends upon the acuteness of perception. . . . Certainty is found to exist in the sensations of the artist himself, rather than in the principles of the art.[40]

and in another work,

> For studying the phenomena which living bodies exhibit to our view, and for tracing their history with accuracy, it is not necessary that we know the nature of the principle which animates them, or the manner in which it brings their powers into action. . . . Observation, experience, and reasoning are sufficient for our purpose—we require nothing more.[41]

These words of Cabanis, evidencing Hippocratic faith in the artistic sensibility of the physician and decrying the necessity for following theoretical procedure, come close to defining Jefferson's own philosophy of medicine.

[39] R. H. Shryock, *op. cit.*, ch. 2.

[40] P.-G.-J. Cabanis: *Du Degré de Certitude de la Médecine*, Paris, 1803, 130-31.

[41] Same author: *Revolutions of Medical Science and Views Relating to Its Reform*, London, 1806, 11-12.

CALVIN JONES (1775-1846)

Some of His Contributions to Medical Practice in New York, North Carolina and Tennessee *

S. R. BRUESCH

A small parcel bearing a Booneville, Mississippi postmark reached my desk in February, 1948.[1] The unwrapping revealed a duodecimo volume of 150 pages; the first 70 pages were covered with small, somewhat erratic handwriting and the remaining 80 were blank. Someone had written on the front end paper: *Dr. Calvin Jones, 1775-1846, physician and soldier*. This notebook contained Calvin Jones' records of ten patients who had suffered from diseases of the eye. He had selected these cases from a much larger group recorded in his other journals, presumably with the thought of using them as a basis for writing a book on diseases of the eye. Dr. John Beckwith had suggested this possibility in a letter to Jones:

> I have lately operated on two eyes for cataracts, and I think with entire success—as soon as they are well I shall send you my notes on the cases.
>
> If you should ever publish a Tract on the subject, I think I can furnish you with hints and cases that will help you to "make up your jewels." [2]

Jones added to his case records some commentary, queries to be answered, and information obtained from his reading on the subject of diseases of the eye. Seven of his ten cases were diagnosed cataract, two as cancer of the eye, and one as ptosis and blindness. The cases of cataract were treated by couching and the cancers by extirpation of the involved eye. Excerpts from the case of John Aiken of Jonesboro, Tennessee,[3] may be cited as an example of the manner in which these records were written:

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* Read at the twenty-ninth annual meeting of the American Association of the History of Medicine, Durham, N. C., April 21, 1956.

[1] Sent by Miss Elizabeth A. Maxwell, a great-great grand daughter of Calvin Jones.

[2] Letter, Dr. John Beckwith to Calvin Jones, Salisbury, N. C., June 19, 1821. Original in University of North Carolina Library (UNC).

[3] John A. Aiken was a man of rare eloquence but owing to the habit of intemperance he never reached the prominence his talents merited. See Goodspeed's *History of Tennessee*. E. Tenn. Ed., Nashville, 1887, p. 897.

June, 1819. Mr. Aiken was formerly a printer of Philadelphia, subsequently a lawyer, a man of talent and living with his brother, Col. Mathew Aiken. He had been blind 8 or 10 years. It was supposed to be occasioned by hard drinking.

Operated on both eyes in the way recommended by Bell.[4] The pain and subsequent inflammation great. Having failed to open his bowels early and finding it necessary to give laudanum soon and largely, had much difficulty in opening the bowels.

At the moment of depressing one cataract he could describe a large man on horseback before the window and see ducks in a pond which he mistook for geese. As soon as I withdrew the needle, one lens rose to obscure about one third of the pupil. Subsequently I was informed that it rose so as to obscure vision entirely. He sees only well with the other eye.

His brother-in-law John Wallister wrote me that he never regretted a benefaction more (he paid me $100 for Aiken) that the only use he made of his sight was to go to the grog shops, come home drunk, and make disturbances in the family.

That Jones learned from his experiences is shown in all his case reports, but this passage from the case of Margaret Coxe (of Moore County, North Carolina) reveals especially clearly his mind at work:

There is a little eminence, apparently an excrescence, where the needle perforated the eye the last time (being the very place where it perforated once before); the eye is somewhat inflamed and painful. Did I injure the eye by depressing the capsule with my crooked needle? Did I occasion so much inflammation by perforating twice in the same place? Did I harass the eye too much by too many successive operations? Were the operations too closely following each other?

Jones then concluded his write-up of this case with the following list of queries:

1. At what precise point did Sir Wm. Adams[5] pierce the eye?
2. Did Dorsey,[6] who says he rubbed the cornea, mean the lucid cornea? This idea is opposed by what he says of *pushing* the fragments through the pupils.
3. How long did Hey[7] keep the needle in the eye and what could have been left to do in his 7 operations?

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[4] Benjamin Bell (1794-1806) described in his *System of Surgery* a technique for couching which involved pushing the opaque lens out of the visual axis by means of a needle inserted through the cornea and pupil.

[5] Sir William Adams (1760-1829) wrote *A practical inquiry into the causes of the frequent failure of the operations of depression, and of the extraction of the cataract.* London, 1817.

[6] John Syng Dorsey (1783-1818). His *Elements of surgery* (Philadelphia, 1813) included a section on eye surgery.

[7] William Hey (1736-1819). Jones probably consulted the 3rd edition of his *Practical observations in surgery.* London, 1814.

4. How can an operator know when he ruptures the capsule? In Miss Coxe's case I saw nothing detached. . . .
5. How many days should intervene between operations on the same eye?
6. Should the perforation be repeated in the same or in different places?
7. Should lead water be applied immediately after the operation or calamine ointment? The former recommended by Hey and the latter by (I think) Nell and Scarpa.[8]

In these queries Jones indicated that he had read the writings of Sir William Adams, John Syng Dorsey, William Hey, and Antonio Scarpa on diseases of the eye. Elsewhere he mentioned the works of Baron M. J. B. de Wenzel, William Gibson, John Cunningham Saunders, Thomas Goulard, and Benjamin Bell. Such extensive reading suggests that Jones was making a serious effort to master the specialty of ophthalmology; his notes indicate that he was comparing his own observations with the experiences recorded in books by well-known surgeons.

In evaluating Jones' accomplishments in the field of diseases of the eye, it is necessary to recall that ophthalmology as a specialty in the United States was in its infancy at the time he was writing these case histories and endeavoring to interpret them. The first four institutions devoted to the treatment of diseases of the eye were established in the United States between 1817 and 1822.[9] The first book published in the United States concerned with diseases of the eye was a reprint of Saunder's *A treatise on some practical points relating to the diseases of the eye* (1821). George Frick, of Baltimore, was the first American to write a book on the eye (1823).[10] The appearance of Frick's book may have diverted Jones from his project of writing a treatise on diseases of the eye. It is more probable, however, that Jones' attention was drawn towards other matters and he never returned to the task of completing his notes for publication.

A study of contemporary letters reveals that Calvin Jones developed a

[8] Antonio Scarpa (1747-1832), the "Father of Italian ophthalmology." His *Saggio di osservationi e d'esperienze sulle principali malattie degli occhi* (Pavia, 1801) was published in English in 1806; a second English edition appeared in 1818.

[9] Hubbell, A. A. *The development of ophthalmology in America, 1800 to 1870.* Chicago, 1908. The four institutions were: New London Eye Infirmary (1817), New York Eye Infirmary (1820), Philadelphia Institution for Diseases of Eye and Ear (1821), Pennsylvania Infirmary for Diseases of the Eye and Ear (1822).

[10] George Frick (1793-1870). *A treatise on diseases of the eye; including the doctrines and practice of the most eminent modern surgeons, and particularly those of Professor Beer.* Baltimore, F. Lucas, Jr., 1823. See also Friedenwald, H. The early history of ophthalmology and otology in Baltimore (1800-1850). *Bull. Johns Hopkins Hosp.*, 8: 184-191, 1897.

considerable reputation in North Carolina and Tennessee as an eye surgeon; he also trained several of his students to do eye surgery. Since his notes indicate that his interest was primarily directed toward problems in technique, his influence must be judged in terms of practical rather than theoretical considerations. His scientific attitude is revealed in these notes; the letters from grateful patients and physicians suggest that he brought relief to many who suffered from diseases of the eye in North Carolina and Tennessee. This contribution is of sufficient importance to justify a brief scrutiny of his life and an attempt at assessing his other accomplishments in medical practice.

Calvin Jones was born April 2, 1775 near Sheffield [11] in Berkshire County, Massachusetts. Of Welsh descent, his paternal ancestor, Thomas Ap Jones, came to Massachusetts in 1651.[12] William Blackmore, his maternal ancestor, emigrated from England to Massachusetts in 1665.[13] His infancy was spent during the troubled times of the Revolutionary War, but peace had come when he was of sufficient age to attend school. A letter from his father, Ebenezer Jones, contains the statement, "Your mother and I made slaves of ourselves that our children might have an education." [14] I have not been able to ascertain in what institutions Calvin Jones received his education, but that he possessed a profound knowledge of many subjects is attested amply by his attainments later in life. The early schools in southern Berkshire County devoted their time to teaching the fundamentals of reading, writing, spelling, and arithmetic. There were also a few private schools in this area which gave more advanced training than the public schools. It is likely that Calvin Jones obtained the fundamentals of his education in one or more of these local schools. Since there is no evidence that he ever attended a college or university, the large library which he assembled must be interpreted as the instrument whereby he developed his mind through a life course of reading. Whichever school he attended prepared him to meet the requirement of the Berkshire Medical Association that intending pupils in medicine have "a good knowledge of mathematics and the English language, and can construe and

[11] I am indebted to Dr. Emerson Crosby Kelly of Albany, N. Y. for obtaining a Certificate of Birth for Calvin Jones from the Town Clerk of Sheffield, Mass.

[12] Haywood, M. D. *Calvin Jones: physician, soldier and Freemason, 1775-1846; being an account of his career in North Carolina and Tennessee.* Reprinted from the *Proceedings of the Grand Lodge*, 1919. Condensed versions of this work appeared also in the *Dictionary of American biography*; and Kelly and Burrage, *American medical biographies.* Baltimore, 1920.

[13] Smith, A. M. *Three Blackmore geneologies.* South Pasadena, Calif., 1932.

[14] Haywood, *op. cit.*, p. 3.

parse the Latin tongue with accuracy." [15] It is probable that Calvin Jones apprenticed himself to some physician practicing medicine in the Berkshire region at the age of 14 (1789) and studied or read under this physician's guidance for a period of three years. Shortly after his 17th birthday, he received this certificate:

> These may certify that Calvin Jones, on ye 19th of June, 1792, offered himself as a candidate for examination in the Healing Art before the United Medical Society. He was likewise examined and approved of by the said Society as being well skilled in the Theory of the Physical Art, and by them is recommended to the Publick, as per Order of James Potter, president.
>
> Doct. David Doty, Secretary.[16]

The United Medical Society which awarded this certificate to Calvin Jones has survived to the present as the Litchfield County Medical Association of Connecticut.[17] In 1779 a small group of physicians met at Sharon, Connecticut, and organized this society with the lengthy title, First Medical Society in the Thirteen United States of America. By 1790 this name had been shortened to United States Medical Society and, as indicated in the Calvin Jones certificate cited above, by 1792 it was called the United Medical Society. Whether this was an official change in title or an abbreviation for convenience is not known. Although Calvin Jones nowhere mentioned the name of his preceptor in his voluminous correspondence, it is tempting to speculate that he was a pupil of either James Potter or David Doty. Both were prominent practitioners in the region and were interested in medical education as well as medical societies.

The youthful Calvin Jones can next be located in practice at Freehold, New York. He made his presence known to the people of that area by having the following notice inserted in the Catskill *Packet* for July 29, 1793:

> Dr. Jones respectfully presents his compliments to the citizens of the town of Freehold, and informs them, that he has at length determined on fixing a permanent residence in that town, where he proposes to continue, as usual, in the practice of his profession—returning grateful acknowledgments for the encouragements they

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[15] Smith, A. M. Medicine in Berkshire, pp. 115-181, in *Book of Berkshire, Papers by its Historical and Scientific Society*. Pittsfield, Mass., 1890.

[16] Haywood, *loc. cit.* Haywood evidently misread this handwritten certificate and wrote the name of the president James Batten rather than James Potter. I have not seen the original of this certificate.

[17] Steiner, W. R. The date of the organization of the Litchfield County Medical Association. *Yale J. Biol. & Med.*, *9*: 127-136, 1936.

have so generously given him in his line of business; and he flatters himself that he will be able to merit a continuation of their favours, and will ever esteem it as a very distinguished honour to receive their commands. July 25.[18]

He continued to practice in Freehold during 1793 and also was able to find time for writing. On August 4, 1794, the Catskill *Packet* carried the following notice:

Just published, and for sale at this Office, price one shilling, Doct. Jones' Treatise on the Scarlet Fever, or Canker-Rash. Subscribers will please call for their books.[19]

The preface to this work is dated December 10, 1793. The youthful author stated that in this treatise "the principles of the great Brown have been uniformly adopted; principles in every respect most exquisitely sublime, and which require only to be better known, to be universally received." He pointed out his lack of confidence in the views of Cullen and Sydenham on scarlet fever and then observed that "our countryman, Dr. Rush of Philadelphia, is the most consistent on the subject, but he is cursory in his observations; and all have erred in treating varieties of it as distinct diseases." Most of the text of the treatise is concerned with a description of the clinical features of the disease as observed by Jones between Aug. 5, and Nov. 12, 1793. He did not state the number of cases which came under his care but implied that he saw a large number. He described first the symptoms in the order in which they develop under ordinary conditions and then deviations which he noted in connection with variations in climatic conditions (such as extremes of heat and cold). He noted that the eruption commonly appears on the second day of the disease but in some cases it does not appear until as late as the fifth day. He then pointed out that scarlet fever is highly contagious and had, in different places, made its appearance in all seasons of the year. He noted further:

This contagion has no effect on some persons who are of an age most subject to it, while I have seen it break out in a family who had no intercourse with any

[18] This notice appeared also in the *Packet* for Aug. 13 and 20, 1793. Files of the Catskill *Packet* were examined at the Yale University Library. It is possible that Calvin Jones decided to settle at Freehold because of an opening there created by the death of Dr. Elisha Camp, which was noted in the *Packet* of June 3, 1793.

[19] *A/ treatise/ on the/ Scarlatina Anginosa:/ or what is vulgarly called the/ Scarlet Fever,/ or/ Canker-Rash./ Replete with every thing necessary to the/ Pathology and Practice,/ deduced from actual/ experience and observation./* By Calvin Jones,/ Practitioner of Physic./ Catskill: printed by M. Croswell & Co./ M,DCC,XCIV. 23 p. Five copies have been located: National Library of Medicine, Library of the New York Academy of Medicine, New York Public Library, Yale Medical Library, and the Boston Medical Library.

other family for twelve days, who lived half a mile distant from any other person, and who had never been within a mile of any diseased person; here the whole family was affected and with violence.

Children are much more subject to this disease than adults. . . . Subjects most liable to a mild disease, are infants under 12 months old; above which age, and below the age of puberty, they are more liable to a violent disease; and above which, until the middle of life, the disease is less violent, but far from being so moderate as in infants. This affection in those past the vigour and in the decline of life has never occurred to my observations.

Concerning the nature of the contagion, Jones wrote: ". . . we do not know how long the contagion remains in the body, after infection, before the disease makes its appearance; or whether it is alike in all subjects." After some theorizing about certain other features of the disease, Jones completed his treatise with a discussion of therapy. His method of treatment, largely symptomatic, is consistent with the generalization he made in the preface that " it is evident that no one remedy, or particular set of them, are promiscuously to be employed in the cure of this disease; which the author thought proper to mention, as *quacks*, ever ready to impose on the credulity of the vulgar, to enhance the pretended merit of nostrums, have asserted." Jones wrote this treatise in a clear, rather elegant style and in it distinguished what was drawn from his own experience and what he had learned from others. Altogether this treatise is a worthy effort for a youth of 18.

Calvin Jones left Freehold sometime in 1794, possibly during the month of August.[20] His movements for the next few months are not known, but the hiatus is small for he can be located in Smithfield, Johnston County, North Carolina, in 1795.[21] During the eight years in which he lived in Smithfield, Jones seems to have concerned himself principally with the practice of medicine. There are indications that he developed a large practice while at Smithfield although he may have been dissatisfied with the financial return from it. In 1799 Jones was one of a small group of physicians who met in Raleigh to organize the first medical society in North Carolina. He took a leading part in the organizing of the North

[20] His departure in August is suggested by the following notice which appeared in the Catskill *Packet and Western Mail* for Aug. 23, 1794: " All persons indebted to the subscriber, are informed that their notes and accounts are lodged with John V. D. S. Scott, Esq. attorney at law in Catskill, and will be put in suit unless prevented by immediate payment. Calvin Jones."

[21] Haywood, *op. cit.*, p. 4. Also see Lewis, J. S. Berkshire men of worth. Berkshire *Evening Star*, 1937. A scrapbook of clippings of this series was examined in the Pittsfield Public Library.

Carolina Medical Society and served as its corresponding secretary during its five years of existence.[23]

The activities of Calvin Jones in connection with the introduction of vaccination into North Carolina deserve attention.[23] Jones had printed in the Raleigh *Register* for March 11, 1800, a notice that he planned to inoculate against smallpox during the month of April but in the *Register* for April 8 he announced a postponement of the inoculation until the following year. The reason he gave for the delay was pressure of business, but it is more probable that he had heard of Jenner's work in March, 1800, and wanted time to obtain more definite information. It will be recalled that Waterhouse published his "Something curious in the medical line" in the *Columbian Sentinel* for March 12, 1799, but the results of his first use of Jenner's vaccine were not published until September 20, 1800.[24] Whatever the source of his first knowledge of vaccination, Jones read most of the available publications on the subject during late 1800 and early 1801. The result of his reading can be judged from the long letter which he dated March 25, 1801, and had published in the Raleigh *Register* for April 14, 1801. This important letter is too long to print entire in this paper but the following excerpts will convey an idea of the whole:

> The discovery of a new disease called the Variola, or Cow-Pox, which promises to disarm the Small-Pox of its terrors and its dangers, by rendering those who have this disease unsusceptible of the infection of Smallpox, has lately been promulgated in the United States; and being convinced in my own mind of the utility of substituting this disease for the Smallpox, I shall endeavor to pave the way for its introduction into this country, by communicating a precise account of it to the public. . . .
>
> The Physicians in Europe who have inoculated for this disease, and who have favoured the world with the result of their observation, are Drs. Pearson, Jenner and Woodville, in England; Dr. Anderson, in Scotland; Drs. De Carre, Ferra and Frank in Vienna; and Dr. Valentin, at Montpellier, in the South of France. From the success that has uniformly attended the inoculation in the hands of all these Physicians, and from late accounts which state that the disease is making considerable progress in Portugal, we have reason to believe that it will very soon become general throughout Europe. In America, it has not yet made its appearance, but Dr. Mitchell of New York, and Dr. Waterhouse of New Hampshire, have both received the matter of the disease from England, and propose inoculating early in the present season, so that we may expect it will soon become common in the United States.

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[23] Long, D. Early North Carolina medicine: notes on the history of the medical society. *N. C. Med. J. 15*: 181-182, 1954.

[23] Long, D. Smallpox in North Carolina. *N. C. Med. J. 16*: 496-499, 1955.

[24] Halsey, R. H. *How the President, Thomas Jefferson, and Doctor Benjamin Waterhouse established vaccination as a public health procedure.* New York, 1936.

The public has been taught to expect, from my advertisements last year, that I shall, in the ensuing months, commence inoculation for the Smallpox; but I am prevented from doing this, by the consideration of what is due from me to those who would have been my patients, whose ease and safety my own inclinations, and the honour of my profession bind me to consult. It is the hope of seeing the Vaccine Disease substituted for the Smallpox, that alone induces me to decline the inoculation.

The evils of the Smallpox always extend further than the immediate victims of its ravages. It is extremely distressing to the poor of commercial towns, by the sudden interruption it occasions to the usual course of business. The general introduction of the Cow-Pox, by its not being contagious, will at once put a stop to this source of evils. This, with those other peculiarities in its favour which we have enumerated, clearly evince the propriety of substituting this mild disease for one that is often violent and unmanageable, that destroys beauty, and puts life in jeopardy; and I trust, that in an age which has witnessed so many important improvements in the various departments of Science, no undue prejudices will interpose their influence to prevent its introduction.

That this letter had some influence on the citizens of North Carolina is indicated by this statement in the minutes of a meeting of the Moravians at Salem on April 21, 1801:

In the last newspaper, Dr. Calvin Jones, of this state, announces that he hopes to receive this kind of smallpox, which is called cowpox, and offers to inoculate with it. It will be well to inform our members of his description of this new illness.[25]

The Moravians were favorable to the idea and the Salem records reveal that in 1802 about 80 persons were vaccinated by Dr. Samuel Vierling, the physician for the settlement.[26] Whether Jones supplied the vaccine or instructed Dr. Vierling in its use is not known since the minutes indicate only that they planned to obtain the material from "a certain doctor in Raleigh."[27] Nor are there data as to when Jones first started using the vaccine himself, but letters from physicians dated somewhat later indicate that they looked upon him as the authority in North Carolina on the use of vaccination in controlling smallpox epidemics. It would thus appear that Jones exercised considerable influence on the introduction of vaccination into North Carolina and did much to gain its ready acceptance by the citizens of that state.

Calvin Jones moved to Raleigh about 1803 and began there a period of such varied activities that he became concerned with nearly every phase

[25] Fries, A. L. (ed.). *Records of the Moravians in North Carolina.* Vol. VI: 1793-1808. Raleigh, 1943, p. 2680.
[26] *Ibid.*, p. 2691.
[27] *Ibid.*, p. 2708.

of life in that capitol city. Since this paper is concerned only with his medical activities, those of non-medical nature will either be omitted or mentioned but briefly. His service in several sessions of the North Carolina Legislature brought him into contact with many persons prominent in state politics and he made many warm friends from this group. He edited and published the Raleigh *Star* for several years, served as Intendent of Police (or Mayor) of Raleigh, and was Adjutant-General of the state militia for five years. The latter post brought him into considerable prominence during the war of 1812 and caused him to be addressed frequently as " General Jones." He made several trips to Washington, D. C., and on one occasion, at least, dined at the White House with the Madisons. He was active also in Freemasonry and served as Grandmaster of the Grand Lodge of North Carolina and Tennessee from 1817 to 1820.[28] Some mention must be made also of his great interest in education. He founded or participated in the development of several educational institutions; his most notable effort was his service as a Trustee of the University of North Carolina for 30 years (1802-1832).[29]

Calvin Jones continued to practice medicine after he moved to Raleigh despite the distractions of his political, military, educational, editorial, fraternal, and agricultural activities. That he sometimes turned to eminent physicians in American medicine for consultations is indicated by this letter from Benjamin Rush, written from Philadelphia September 12, 1804:

You have done everything for Mr. Hinton that could have been done in his case by the most experienced and skilful in our profession. I have little to advise, but to continue to regulate your practice by the state of his pulse. I have known two cases in which after copious bleeding in an hemorrhage from the lungs, tonics have performed a cure. The tonic, used in one of them, was Porter—in the other, Cordial Aliment. Blisters to the *back* below the neck I have found useful in Mr. Hinton's disease. Perhaps bathing his sides and breast with an irritant of any kind would divert the blood from his lungs to the external surface of his breasts. The less nourishing his diet, while his blood vessels are highly excited, the better. Even when his pulse will bear cordial food, it shoud *not be* nourishing. In such cases I have forbidden milk with advantage. A diet and drinks by *weight* and measure has sometimes done great things in diseases which are brought on by light exciting causes. During the excited state of his system *Rest* must be enjoined, and exercise when proper, should always be of the supine kind. Have you tried the Acetate of Lead as a styptic? It may be given with safety—from one to three grains three times a day. It has done more good for me than the Digitalis in hemorrhages.

[28] Haywood, *op. cit.*, p. 20.

[29] Battle, K. P. *History of the University of North Carolina.* Raleigh, 1907. Vol. I, p. 822.

Even a colic, excited by it should not be regarded, if it appears to do service, for a little pain in the bowels is safe, compared with bleeding from the lungs. Great care should be taken to keep his feet constantly warm, and if possible moist.

Your patient Mr. Rowland called on me on his way to Boston. Dr. Physick and myself examined his case closely, and prescribed for him, and we think with a reasonable hope of making him a sound man in body and mind.

With great respect and best wishes for the recovery of Mr. Hinton, I am, yours sincerely, Benjm. Rush.[20]

There exists also a letter from Samuel Latham Mitchill, written in 1806, concerning a consultation over one of Jones' patients. But his practice may have dwindled at times, for Gov. B. Williams wrote on July 18, 1806: ". . . this day young Hill has arrived immediately from Raleigh who informed me he saw you & that you said you were never more at leisure than at present for the neighborhood was perfectly healthy."[21] Geo. Swain of Asheville wrote an exceptionally interesting letter in 1810, too long to quote in this paper, about medical practice in Buncombe County. He was concerned principally about "Venereal Complaints" and wrote:

You judge judicially of the species of Disease to which our robust mountaineers are most particularly subject, for I have never as yet had occasion to treat any other. But now there are no less [than] 10 or 12 applications where the disease differs so widely from it that I am at loss how to treat them. . . . I am for want of more proper information treating them in the way recommended by Buchanan with the common Mercurial Pills taking care to ally the inflammation by cooling finger bleedings and some of them appear nearly well but I am fearful the great quantity of mercury administered will be injurious. . . . You will kindly inform me how to distinguish the different diseases. How long a state of salivation may be continued with safety—and the most judicious methods of treatment.[22]

Calvin Jones was concerned with the publication of at least six articles or letters dealing with various aspects of clinical medicine or biology during the period 1808-1819.[23] A search of the files of the *American Farmer*, edited in Baltimore by J. S. Skinner, might reveal several additional publications of medical interest written by Jones.[24] It was while in

[20] Original in UNC.

[21] Original in author's collection.

[22] Letter, Geo. Swain to Calvin Jones, Asheville, N. C. Jan. 26, 1810. Original in UNC.

[23] Long, D. Publications by North Carolina physicians. *N. C. Med. J.*, *14*: 246-248, 1953.

[24] Letter, J. S. Skinner to Calvin Jones, Baltimore, Nov. 5, 1821; Skinner mentioned an article on dyspepsia and asked Jones to write others for his *American Farmer*. Original in author's collection.

Raleigh that Jones became interested in the treatment of diseases of the eye and the earliest case noted in his journals was seen in 1811.

By 1818 Calvin Jones felt the need to purchase more land, both as an investment and for actual use in farming. His marriage, in 1819, to Temperence Boddie Williams Jones added a large number of slaves to his holdings and increased his responsibility for using them efficiently.[35] The opening of the Western District of Tennessee by the Chickasaw Treaty of 1818 attracted his attention and during the late summer of that year he traveled extensively in Tennessee country.[36] He found the land sufficiently to his liking to begin the purchasing of land warrants from North Carolina Revolutionary War veterans or their descendents; these warrants entitled their holders to land in Tennessee.[37] This turned out to be a profitable speculation and by 1832 his holdings in West Tennessee amounted to about 30,000 acres. But rather than moving to Tennessee in 1818 when he first purchased land warrants, Jones decided to remain in North Carolina and in 1821 purchased a tract of 615 acres located about sixteen miles north of Raleigh. He named this plantation Wake Forest and lived there with his growing family for about eleven years. Jones practiced medicine while he lived at Wake Forest but he seems to have been sporadic in this activity. As his land holdings increased in Tennessee he found it necessary to visit that country at almost annual intervals; these long absences no doubt made maintenance of a practice difficult. In 1829 he made an effort to resume active practice at Wake Forest and to restart the training of medical students.[38] However, his medical practice and extensive land interests must not have combined well, for he sold his Wake Forest plantation in 1832 to the Baptist Convention. The Baptists

[35] Calvin Jones' fiancée, Miss Ruina J. Williams, died Sept. 20, 1809. Her sister, Miss Temperence Boddie Williams, who had married Dr. Thomas C. Jones, was left a widow with one child by the death of Dr. Jones. Calvin Jones married the widow Jones April 15, 1819.

[36] Some account of the Chickasaw country lately ceded to the United States, by Calvin Jones. (Raleigh *Register*, Nov. 20, 1818.) This article was reprinted Dec. 12, 1818, in the Nashville *Whig and Tennessee Advertiser*, also Sept. 8, 1819, in the Nashville *Gazette*.

[37] Since Tennessee was a part of North Carolina until 1796, North Carolina was free to grant land warrants to be satisfied in territory which later became the State of Tennessee. Several fortunes were made in speculations on these warrants.

[38] Raleigh *Register*, Sept. 4, 1829: "I have been induced to resume the practice of Physic in consequence of a connexion in business formed with Dr. Hamilton Taylor, a talented physician from Oxford. . . . This connexion, an ample library, convenient offices, and a society almost exclusively professional, may make this an eligible situation for students. Two have been engaged, and two or three others of sufficient preliminary education and really studious habits, would be received. . . . Wake Forest, August, 1829. Calvin Jones."

converted the main dwelling house (which still stands) and seven adjoining slave cabins into classrooms and established there an educational institution which they named Wake Forest College.[39]

Calvin Jones moved to Bolivar, in West Tennessee, after the sale of his Wake Forest plantation in order to be near his vast holdings of land. He constructed a new home, which he named Pontine, near Bolivar and there lived out the closing fourteen years of his life " retired from public employment, and enjoying, with ample wealth around him, the *otium cum dignitate* of the typical Southern planter." [40] Although he did not formally resume the practice of medicine in Tennessee, he was called upon frequently for medical advice by family and friends as well as by other physicians in the area. Dr. Wm. O. White wrote on December 16, 1835:

> I am laboring under a very painful disease and one which confines me entirely. I would take it as a very great favour if you would ride down and see me. I know you are out of practice and feel a delicacy in applying to you, but upon reflection, I think I would prefer your opinion concerning my disease to that of any one else and trust you will not think it an intrusion to make the request. . . .[41]

Also in 1835 Jones had occasion to write to Benjamin Dudley concerning some medical problem and was surprised and chagrined to learn that Dudley had charged him a fee of $10 for the consultation. Jones' letter to Dudley is not available, but Dudley's reply was as follows:

> On my recent return from the state of Missouri, yours, in company with a number of other letters were put into my hands, most of which require answers. I regret that I have not the time necessary to enter into lengthy letters of correspondence upon points in the Profession, of the character embraced in your communication; and on the present occasion an additional subject for regret presents itself to my mind in the request you have made that I should return your letter of the previous date. Not being able to place my hands upon that communication, since I do not preserve the letters addressed to me, it is not in my power to understand a portion of your recent communication which refers to the contents in part of the former. I am gratified that you should entertain the idea of consulting the distinguished gentlemen of Cincinnati. You will find among them a large amount of talent and of professional learning. There is no duty more embarrassing to me than that of correspondence among professional subjects with a view to shed lights upon individual cases of disease among my equals in age and experience who have imbibed the sentiments of our masters and have practiced in accordance to the principles inculcated by our teachers. In our own country, in France, Great Britain, Italy and

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[39] Paschal, G. W. *History of Wake Forest College*. Wake Forest, N. C., 1935, p. 46.

[40] Haywood, *op. cit.*, p. 26.

[41] Letter, Dr. Wm. O. White to Calvin Jones, Whiteville, Tenn. Dec. 16, 1835. Original in author's collection.

Germany, I have witnessed much variety, and such opposition in opinion and sentiment, not only in regard to isolated cases of disease, but to the elementary principles of the science, that I have long since been taught to disregard authority, except so far as great names and incontrovertible principles were closely allied.

I have principles and practices which I cannot refer to any author; and while I inculcate them successfully on the classes of this institution, they are powerless with all those who have already imbibed principles and systems of practice for themselves. The profession is progressive. Sir Astley Cooper taught me errors on the subject of the bandage which have been most triumphantly refuted in many most important cases in surgery.

While I acknowledge my obligations to him, to Abernathy, to Larrey, Boyer, Dubois and to Cuvier with many others; yet to errors under the sanction of these, my great masters names, I own no allegiance.

As it is my custom to demand a fee from my professional brethren for consultation, I am at a loss to understand the causes which gave rise to it in the present case, and although it may be recognized as proper, I should have been more pleased had it been otherwise. With great respect, etc. B. W. Dudley.[42]

Jones noted sarcastically on the reverse of Dudley's letter:

Don't preserve letters, how can he refer to them for contained prescriptions? Rather important provided a man cares for what he prescribes.

Calvin Jones died Sept. 20, 1846, and was buried in the Polk Cemetery at Bolivar. The State of Tennessee purchased his Bolivar estate from his heirs and in July, 1890, the buildings which had been erected on this site were dedicated as the Western State Hospital for the Insane. The Administration Building of this large institution occupies the ground upon which stood Jones' home, Pontine.

At the dedicatory ceremony, Judge Sneed said:

I particularly remember his tender sympathies for that unfortunate class whose reasons were overthrown, and his theories upon the treatment of mental diseases. And now, as I look upon the splendid pile which has taken the place of that happy homestead and reflect upon the noble and Christly purposes to which it is today dedicated, I can but think if the grand old man, with all his tender solicitude for a better and holier treatment of the mind diseased, could revisit the ground on which his happy homestead stood and see the changes for himself, he would rejoice that things are just as they are. All honor to the memory of General Calvin Jones![43]

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[42] Letter, Benjamin Dudley to Calvin Jones, Lexington, Ky. Aug. 6, 1835. Original in UNC.

[43] Haywood, *op. cit.*, p. 30. Haywood quoted from Memphis *Evening Democrat*, July, 1890.

DRAMATIC PRESENTATIONS BY MENTAL PATIENTS IN THE MIDDLE OF THE NINETEENTH CENTURY, AND A. DUMAS' DESCRIPTION *

GEORGE MORA

The aim of this paper is to illustrate the early attempt, made in the middle of the nineteenth century in the mental hospital of Naples, to have patients take part in the performance of dramatic presentations.

In order to place this event, which so far has escaped the attention of both medical historians and psychiatrists, in the appropriate frame of time and environment, the development of this mental hospital should be briefly mentioned.[1]

From the sixteenth century until the nineteenth, mental patients occupied a section of a big hospital in Naples, the "Saints Home for the Untreatable." Methods of treatment were quite primitive, and physical punishments not unfrequent, as was the general practice of the time. Only during the second part of the eighteenth century, following the cultural influence of the Enlightenment in all Europe, Naples experienced a considerable growth of interest in arts and science. The series of the most outstanding men of this era begins with Giambattista Vico, the founder of modern historiography and continues with Antonio Genovesi, first professor of political economy in Europe, and Gaetano Filangieri, the famous author of the *Science of Legislation* and a friend of Goethe.

In medicine, this was the time of the dispute about the Brownian theory of stimulation and of counter-stimulation, and in Naples—as in the rest of Europe—there was a lively discussion of the great philosophical systems on which contemporary medicine was based. But the most outstanding clinicians, like Domenico Cotugno, who first described in detail the cerebrospinal fluid and the vestibular acqueduct, and Domenco Cirillo, a member of the Royal Society of London, remained faithful to the Hippocratic tradition.

The mental patients who, in the meantime, had been transferred to an

* Paper read at the twenty-ninth annual meeting of the American Association of the History of Medicine, Durham, N. C., April 20, 1956.

[1] For the development of the mental hospital of Naples and of psychiatry in general in southern Italy in the past century, see: Mora, G., Biagio Miraglia and the Development of Psychiatry in Naples in the XVIII and XIX Century. To be published in *The Journal of the History of Medicine and Allied Sciences.*

old building in Aversa, about 15 miles from Naples, were under the care of Antonio Sementini, a physician who had shown a very early interest in psychiatry, publishing a book on mental diseases in 1764 at the age of 21.

The treatment of the patients remained, however, rather undeveloped. Mental hospitals at that time were organized on a very primitive basis and lacked many of the prerequisites which today would be considered essential everywhere. It was only a few decades before that the humanitarian reform for the treatment of mentally sick patients had been initiated in England and at the Salpêtrière in Paris. The reform of the hospitals, demanded in France by Colombier (1785) and Bailly (1786) and initiated in Florence by Chiarugi (1789), in Paris by Pinel (1793), in England by Tuke (1796), and in Germany by Langermann (1805), did not seem to encounter rapid success. The resistance to reform, based on all sorts of prejudices, was tremendous. The great majority of mental hospitals still remained in very poor condition and that of Aversa was no exception, though many improvements had been made.

But times were now more mature for basic changes in society towards a better understanding of the individual's needs and his rights. The feeling of freedom and of equality that the French Revolution had awakened all over the world, was communicated with the greatest intensity to the kingdom of Naples which, for many reasons, had languished in misery and darkness for centuries. The French influence was felt there more than in many other countries, due to the fact that Joachim Murat, as king of Naples, surrounded himself with a large number of French officers and local enlightened and progressive men.

Among the reforms introduced by Murat was the improvement of the hospital system. A new mental hospital was established in Aversa in 1813 and put under the direction of Giovanni Maria Linguiti. The methods of treatment used by him were comparable to the most progressive ones adopted in other countries of Europe, and were far from the old restrictive and punitive attitude towards mental patients. The reports of the well-known physicians who visited Aversa at that time are in agreement on this point: J. P. Frank,[3] G. Valentin,[3] J. Guislain,[4] all expressed consideration for the hospital. Esquirol[5] reported that it was

[3] Frank, J. P., *Medizinische Polizei.* Suppl. Band III, Leipzig, Kuhn, 1827, p. 164.
[3] Valentin, G., *Voyage médical en Italie.* Paris, Gabon, 2nd ed., 1826, p. 60-62.
[4] Guislain, J., *Lettres médicales sur l'Italie.* Gand, Gyselyinck, 1840, p. 178-181.
[5] Esquirol, E. D., Note sur les aliénations comparées dans le royaume de Naples et les hôpitaux de Paris. *Acad. de Méd.*, Sept. 5, 1826.

widely considered as a model to be copied, and Brierre de Boismont[6] referred to the opinion of many that it was the first institution of this type in all Europe.

The famous F. Morel,[7] who visited the hospital in 1845, was particularly impressed by the extensive program of occupational therapy which constituted a rather distinctive note of the hospital. He referred to the name of the young physician Biagio Miraglia as one among the physicians interested in this plan.

Biagio Miraglia was at that time 31 years old, having been born in 1814 in Cosenza, a large town of southern Italy. Influenced since childhood by ideals of political freedom, he composed in his youth several dramatic plays, all centered around the theme of patriotic love. After graduating in medicine in 1837 in Naples, he became a follower of Gall's phrenology, an idea to which he remained faithful all his life. It is possible that he was influenced in this respect by the Italian studies on physiognomy, which—as is known—had their most famous representative in Giambattista Della Porta in the sixteenth century.

At any rate, Miraglia was nominated physician of the mental hospital of Aversa in 1843. In that same year he began to publish a journal which is generally recognized as the first Italian journal completely dedicated to psychiatry. A few years later, in 1849, he published a new classification of mental diseases and a project for a model mental hospital which he re-elaborated later.

Because of his liberal tendencies, he was put in prison for two years, between 1849 and 1851, together with many other representatives of culture of southern Italy. It was during that time that he wrote an extensive "Treatise of Phrenology," the best published in the Italian literature. After the liberation of southern Italy in 1860 and the establishment of the kingdom of Italy, Miraglia became superintendent of the mental hospital, resumed the publication of a psychiatric journal, founded the Italian Psychiatric Association, and became the first professor of psychiatry at the University of Naples. In his later years, well-known in Italy as well as in other countries, he became especially interested in legal psychiatry and in criminal anthropology. When he died in Naples in 1885, his foremost pupil, Gaspare Virgilio, was already superintendent of the mental hospital of Aversa and an outstanding student in the field of criminal anthropology.

[6] Brierre de Boismont, A., Des établissements d'aliénés en Italie. *Journal complémentaire des sciences médicales*, 1830, *43*, 225-249; 1832, *44*, 162-182.

[7] Morel, F., Pathologie mentale en Italie. *Ann. méd. psychol.*, 1846, *7*, 78.

It would be very difficult to report, even in summary, Miraglia's theoretical and practical concepts of mental diseases. Only some basic points can be mentioned here. A constant theme which runs through all his work is that, in a mental hospital, everything should be centered around the patient, that mentally sick patients should be treated with humaneness and that "moral treatment" should never be disregarded. Also constant in Miraglia's conception is the emphasis on the value of occupations for patients through which, in his opinion, mental faculties could be preserved and maintained in good function.

Miraglia employed several types of occupation for patients, from handicraft to agriculture and music, dramatic presentations being one of them. It is not clear whether this type of presentation had been initiated before Miraglia since a theatre was built in the mental hospital of Aversa at the time of its opening in 1813. A theatre is also described in the mental hospital of Palermo around the same time.[8] Many visitors, including Lady Morgan and the Belgian psychiatrist, Guislain, were impressed by the spontaneous dramatic ability of the people of the region of Naples, a trait which, in recent years, has been submitted to scientific investigation.[9]

[8] The exact date of the beginning of dramatic presentations by mental patients is difficult to ascertain. It seems sure, however, that representations of a similar type were given in more than one institution in that part of Italy in the nineteenth century. The French embryologist, Valentin, above mentioned, refers to some representations given by youngsters in the "Albergo dei Poveri," an hospice for the poor in Naples (Valentin, G., *op. cit.*, p. 68). The presence of a theatre, built by Linguiti, in the mental hospital of Aversa at the time of its opening (1813), is mentioned by the same author (*op. cit.*, p. 61), as well as by Morel in a report on his visit to Italy (Morel, F., *op. cit.*, p. 82), and by Miraglia himself (Miraglia, B., Relazione alla commissione amministrativa del R. Manicomio di Aversa, *Ann. Frenop. Ital.*, 1867, 5, 49-50). Morel's report also describes another theatre, an open one, used in the mental hospital of Palermo, where therapy was essentially based on occupation. In Morel's words "it was a theatre similar to those used for presentations in the Roman Pompeii." It was not in use, however, at the time of Morel's visit because the representations created an atmosphere "qui exaltait trop l'imagination d'un peuple ardent" (Morel, F., *op. cit.*, p. 82).

[9] Descriptions of the psychological characteristics, especially in regard to gesture and language, of the population of southern Italy, are not infrequent in the writings of travelers of the nineteenth century. It was observed that the inhabitants of that region seemed to be unable to isolate verbal communication from its motor expressive component. Therefore their language—in most of its expressions—was accompanied by an emotional participation of the whole person, in particular of the face and hands.

Lady Morgan, for instance, wrote of the people of Naples: "Their organs are more acute, and their impressions more vivid than those of other nations; and their overabundant vitality, uncalled on by their torpid institutes, bursts forth as it can, and wastes itself in shrill sounds, that render the language superfluous" (Lady Morgan, *Italy*, vol. III, London, Colburn, 1824, p. 242). "Their salutations look like coquetry, and the

At any rate, Biagio Miraglia was doubtless the first to organize carefully such a type of representation. As detailed information on this subject is very scanty, it is only by a fortunate circumstance that a very lively and accurate description of these performances is available to us.

This description is due to the pen of Alexander Dumas, father, in an article in three parts published in the Parisian newspaper, *La Presse* of 1863.[10] As is well-known from Dumas' biographies, the famous French writer spent almost four years, between 1860 and 1863, in Naples. He had arrived on a small boat, as an enthusiastic supporter of Garibaldi's expedition of "The Thousand," and after the end of the war, in 1860, had settled there with the official job of superintendent of the excavation work of Pompeii whose ruins had begun to arouse interest among archeologists.[11] This occupation left him much time which, hard worker that he was, he occupied chiefly by writing. Unfortunately his creative power, after such major works as *Les Trois Mosquetaires* and *Le Comte de Monte-Cristo*, both published in 1844, was almost completely exhausted, and he spent his time—as a modern biographer writes—outlining "new books for his Paris market, books that were often mere rewritings, translations, or old notes flung together,"[12] "material in the form of

facility with which they converse with each other at a considerable distance, by a sort of telegraphic movement of hand and arms, savours of magical intelligence" (*op. cit.*, p. 250).

The Belgian psychiatrist, Joseph Guislain, whose description of his travel in Italy is remarkable for its depth and insight, wrote around the middle of the nineteenth century of the people of Naples: "There is continuous movement of hand and of fingers, as well as a typical way of gesture in the bodies; these people give the impression of knowing a language of signs, universally used among themselves. There are in these people great agility, liveliness, intelligence, readiness in the impulses, as well as wildness and rudeness." (Guislain, J., *op. cit.*, p. 186.)

The particular way of gesture and motility of southern Italians has recently been investigated by psychologists and sociologists. (See: Efron, D., *Gesture and Environment*, New York, Kings Crown Press, 1941; Efron, D. and Foley, J. P., A Comparative Investigation of Gestural Behavior Patterns in Italian and Jewish Groups Living under Different as well as Similar Environmental Condition, *Zschr. f. Sozialforsch.*, 1937, 6, 151-159, reprinted in Newcomb, E. L. and Hartley, E. L., *Readings in Social Psychology*, New York, Holt, 1947, p. 33-40).

[10] Reed, F. W., *A Bibliography of Alexander Dumas Père*, London, J. A. Neuhuys, 1933, p. 440. The author refers to Dumas' articles as: "Les Fous du Dr. Miraglia" followed by the subtitle: "A Graphic Description of the Treatment of the Insane by a Dr. Miraglia." He does not report, however, where this article was orignially printed. Dumas' article was republished as an appendix to the standard edition of "Jacques Ortis" in the Calman-Levy series. In Le Vasseur's *Dumas Illustre*, it forms part of vol. XVI.

[11] In fact the scientific excavations of Pompeii were started in 1860 by Giuseppe Fiorelli, professor of archeology at the University of Naples.

[12] Gorman, H., *The Incredible Marquis, Alexander Dumas*, Farrar, New York, 1929, p. 406.

translation, paraphrases and journalistic causeries calculated to fill the columns of periodicals." [13] Most of these articles were in the form of letters on some aspects of Garibaldi's campaign—a fantastic, yet real adventure—to be published in *La Presse* by his friend, Emile de Girardin, editor of the newspaper and also an admirer of Garibaldi. This sideline soon proved to be very worthwhile to Dumas, not only because it provided him with some money—which he always needed very badly since he always spent it profusely—but also because these letters scored a large success for both editor and author. Craig Bell, another modern biographer of Dumas, rightly states that " by them Dumas can justly be claimed as the first accredited war correspondent, and it is to be doubted whether there has ever been a better." [14]

Several reasons must have determined Dumas' interest in Miraglia's representations. Dumas was generally interested in many new ideas including also expressions of humanitarian and patriotic feelings from whatever source they came.[15] There was some sort of continuum between his fantasy, ranging without limits through the entire world in search of the strangest adventures, and his real life, absorbed in the ideals of liberation of the peoples still oppressed by tyranny.

The plays given by Miraglia certainly had a particular appeal to him. They were, in fact, almost all—if not all—plays whose content conveyed strong patriotic feelings. The titles of the few plays available to us clearly demonstrate this point: *Bruto primo*, *Polinice*, *Timelone*, all three tragedies of Alfieri, were essentially based on the idea that love for one's country must be considered superior to everything else, even to familial affection, while human love plays only a secondary role. As one can imagine, this type of play must have had a strong appeal to the public as well as to the actors at that particular historical period, around the 1840's and the 1850's, at the height of the political struggle to achieve national autonomy throughout Europe.

The production of this kind of dramatic play was, among other things, a means of expressing feelings which would otherwise have provoked repression by the police: as it was, these intense emotions were only due to

[13] *Op. cit.*, p. 412.

[14] Bell, Craig A., *Alexandre Dumas. A Biography and Study*. Cassell Co., London, 1950, pp. 327-328.

[15] For instance, some years before, in 1835, he had visited another Italian mental hospital, that of Palermo, and had given an interesting description of the work done there by its director, the baron Pisani (*La Vie d'A. Dumas racontée par A. Dumas*. Textes recueillis par Alan Guérin, ed. René Juillard, Paris, 1953, pp. 213-221).

the play-acting of "crazy" people! The police must have felt particularly embarrassed by these representations since they were officially given "for the benefit of the poor insane of the mental hospital of Aversa" (as was stated in a manifesto reproduced a few years ago by Miraglia's grandson.)[16] Moreover, quite a few of these representations were given in the "Teatro del Fondo," a theatre well-known for the patriotic content of its performances.[17]

Dumas' description refers to a play given in 1863, when there was complete political freedom and less anxiety about the expression of patriotic feelings. Perhaps the entire situation was somewhat different from that of a few decades earlier when the representations were given under the suspicious eye of the police. Dumas' article describes the performance of *Le Bourgeois de Band*, a play by Hyppolite Romand, now almost completely forgotten,[18] to a friend of his in Paris, a certain Dr. Castle. It was for Dumas "un des spectacles les plus extraordinaires que j'ai jamais vus," and fortunately so, because he was then stimulated to meet Dr. Miraglia personally and to learn other important details of the performance of great interest to us.

Dumas says, in fact: "I resolved to find out from Mr. Miraglia himself the reasons which had brought him to make tragedians and comedians of some of his mentally sick patients, and I asked him in what way he had been able to obtain such a complete result." Dr. Miraglia answered in these terms: "First of all, I wanted to show the public that the insane must not be treated as furious animals and completely rejected from the human family: a very keen observer, able to recognize which mental functions are impaired, can also recognize which ones are still intact, and can improve these latter through exercise; so that insanity can be considered only as a dark spot on the spirit, a dim point on the light. Nothing seems more natural than this fact, understandable at the first impression. Once the faculties still normal are recognized, one must exercise them, avoiding at the same time that the impaired functions enter into a state of excitement. Patience, perseverance, good will, and tenacity are

[16] Miraglia, B., Jr., Un Grande Frenologo Italiano: Biagio G. Miraglia. *Boll. Ist. Storico Ital. dell'Arte Sanitaria*, 9, 1929, pp. 217-243.

[17] On the "Teatro del Fondo" see Croce, B., *I Teatri di Napoli*, Bari, Laterza, 1916, pp. 266. The "Teatro del Fondo" later became the "Teatro Mercadante" which still exists today in Naples.

[18] The only information available to the author on this play was that reported in the *Grand Dictionnaire Universel Larousse*, lettre B., p. 1124. The exact title of the play was "Le bourgeois de Grand ou le secrétaire du Duc d'Albe" and the first performance was given in Paris, in the Odéon, on March 21, 1838.

the means to obtain the confidence of those poor patients and to lead them to the exercise of the intact functions, relaxing in the meantime the impaired functions: *it is essential to put a patient in relationship with another or several other patients, in order to direct toward the same goal the intact functions of several minds partially impaired.*"

In 1863 more than twenty years had passed since such presentations were first given in theatres of Naples in the presence of a normal audience paying a regular admission price. The audience was particularly sympathetic toward the representations, to the point of calling it a miracle that some of the actors were mental patients. It is known that the dramatic presentations were prepared with great care over a period of some time, that is, they were not spontaneous and extemporary productions of patients as is the case in modern psychodrama.[19]

Only male patients took part in these performances. A similarity to

[19] Psychodrama is one of the methods of group psychotherapy. Group psychotherapy, which includes all forms of psychotherapy aimed at a group, instead of individual patients, was practiced *ante litteram* by a few pioneers, since the beginning of this century: Joseph Pratt in 1905 with his class, first of tuberculous and later of diabetic patients, at the Massachusetts General Hospital; Edward Lazell in 1919 at the St. Elizabeths Hospital in Washington, and Cody Marsh in 1930 in a New York Hospital with lecture "classes" or discussion among mentally sick patients. It was only later, however, that the psychological dynamics of the group were more thoroughly investigated and that some knowledge of its functions and tendencies acquired scientific validity. To this more recent phase belongs the work of the Viennese physician, Jacob Moreno, established in New York some years ago, who first used the word "psychodrama" to describe the type of therapy in which mentally sick patients spontaneously improvise dramatic plays in front of an audience. The theoretical implications formulated by him are too complex to be analyzed here. It is sufficient to say that the patient enacts certain conflicts which are the expression of a part of his own ego and that his role is not an isolated one, but an interpersonal experience. Moreno states specifically that "psychodrama has apparently no precedent in historic times" and that "for a true precedent we must look into civilizations of the prehistoric period" (Moreno, J. L., *Psychodrama*, New York, Beacon House, vol. I, 1946, pp. 12-13). For the history of group psychotherapy, see: Dreikurs, R. and Corsini, R., Twenty Years of Group Psychotherapy, *Am. J. Psychiatr.*, 1954, *110*, 567-575; Bromberg, W., *Man Above Humanity*, Philadelphia, Lippincott, 1954, 289-298; Corsini, R., Historic Background of Group Psychotherapy: A Critique, *Group Psychoth.*, 1955, *8*, 219-225; and especially the recent and exhaustive study by Bach, G. R. and Illing, H. A., Historische Perspektive zur Gruppenpsychotherapie, *Zschr. f. psychosom. Med.*, 1956, 2, 131-146).

However, in the history of dramatic art we find a form somewhat similar to psychodrama and to Miraglia's dramatic presentations, especially in regard to the appeal to the unconscious of the audience, viz. the *commedia dell'arte*, the well-known representations of improvised actions by stereotyped personnages of comic appearance, wearing a characteristic costume and mask. The *commedia dell'arte* was not simply based on improvisations as is psychodrama, but was actually a recitation of stereotyped motives, selected by the actors from a large memorized repertoire, as appropriate to the particular situation (Smith, W., *The Commedia dell'Arte*, New York, Columbia, Univ. Press, 1912, p. 13).

Greek tragedy, which exerted such a great influence in southern Italy through centuries, is obvious. The reasons given by Miraglia himself for this limitation were that in his instituton the female patients were all of a lower class, that it would not have been proper to bring women on the stage, and that women, more than men, would have the tendency to improvise speeches instead of following the text of the drama.

In these considerations, one may find the reason why love relations were practically absent from the pieces selected for presentation. In Miraglia's mind pieces based on patriotic love could provide a good substitute for the expression of strong emotional feelings without recourse to love scenes.

Dumas' article includes a detailed description of the patients taking part as actors in the presentation of *Le Bourgeois de Gand*. He stated that of the eight personnages in this play, only six could be present at the performance in Naples, as two others were prevented by an acute psychotic episode (*délire aigu*) just before the presentation.

This incident is significant in several ways: first, it indicates, even more clearly, how sick some of the patients were; secondly, it suggests that the feelings agitated during the rehearsals or in connection with the presentation itself may have been a precipitating factor in the psychotic episode; finally, the group of actors consisted of both mental patients and supposedly normal healthy employees, a possibility which was foreseen by Miraglia.

Considerable patience and understanding were certainly necessary on the part of those involved in the preparation of the performance. Dr. Miraglia, himself producer and at times author of some of the pieces, was probably assisted by other people in this work.

The way patients were treated, in the attempt to decrease their anxiety and to make them more comfortable, was certainly remarkable. It is indeed an indication of the deeply humanitarian treatment and of the very good patient-doctor relationship prevailing at the mental hospital of Aversa.

Nothing serves better to illustrate this point, than to follow closely Dumas' description. The patients were transported from Aversa to Naples, a distance of about 75 miles, by Miraglia personally, in a few coaches. One of the patients, a certain Felice Persio, was accompanied by Miraglia to a hotel of Naples and given a very good dinner. He was evidently very sick for, according to Dumas, once he had reached his

Two illustrations of the representations by patients of the mental hospital of Aversa in the theatre "Giardino d'Inverno," in Naples, in 1864.

Fig. 1. Echilo: Die, tyrant, die!
(From V. Alfieri's *Timelone*, act V, last scene).

Fig. 2. From Biagio Miraglia's tragedy *Messalina*, act V, scene VIII.
(Painting by a mental patient.)

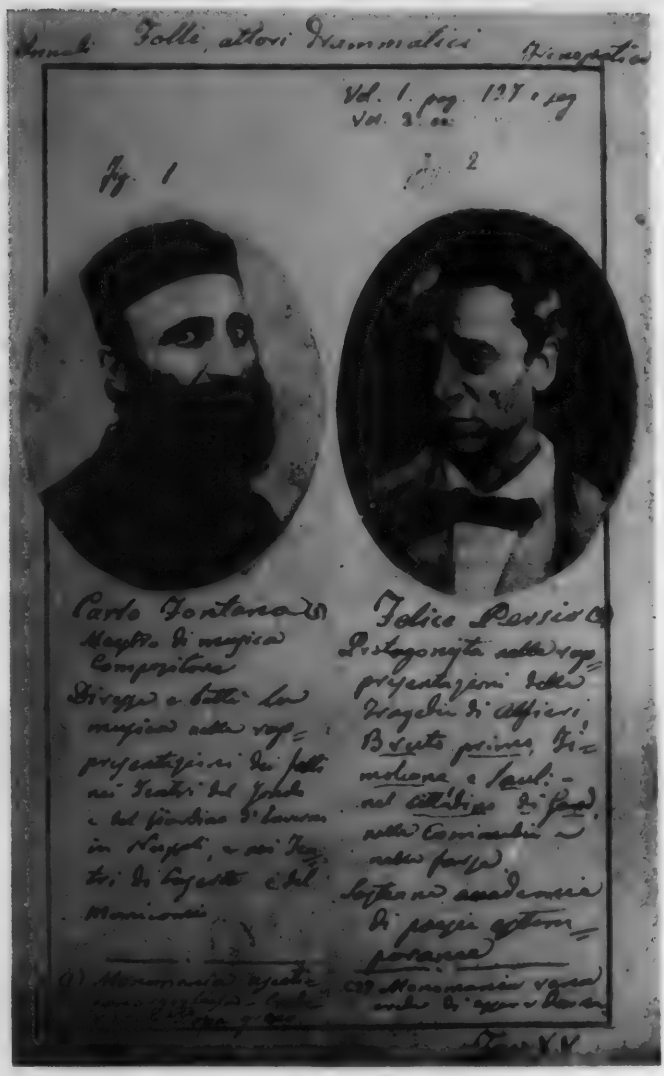

FIG. 3. "Mental patients, dramatic actors."

Left: "Carlo Fontana, orchestra director, composer. He directed the music of the presentations by mental patients in the 'Teatro del Fondo' and in the 'Giardino d'Inverno' in Naples, and in the theatres of Caserta and of the mental hospital. Diagnosis: ascetic monomania. Full of pride, he had the delusion of being a Greek 'pope.'"

Right: "Felice Persio. Protagonist in the presentations of Alfieri's tragedies *Bruto Primo*, *Timoleone*, and *Saul*, in *Le citoyen de Gand*, comedies and farces. He participated in meetings on contemporary poetry. Diagnosis: Monomania. Full of vanity, he thought he was a woman."

room, he undressed completely, covered himself with soap and water, lighted a cigar and paced the room for some time.

Apparently each patient received a certain reward before entering upon the stage, perhaps to increase his cooperation. For instance, some patients received mirrors, others, ice cream. Felice Persio, the particular patient described in more detail, received 25 napoleons which he kept in his billfold on his chest during the performance. This did not prevent him from throwing them through the window as soon as he arrived back at the hospital. Such a disturbed patient, under constant supervision by Miraglia who was at times obliged to restrain him physically, once the signal was given for the beginning of the presentation—to quote Dumas—"got up, coughed a little, fixed his hair and did all the things that an artist does before entering the stage, so that when the curtain was raised he appeared to be in perfect control of himself."

Felice Persio was a 45-year-old man, whose father had also been mentally sick. He had been a comedian and had done a song and dance act for many years. He probably belonged to one of the vagabond troupes of comedians, not too uncommon at that time. He had been in Aversa's institution for about five years at the time of Dumas' description. His condition was described as a case of "mania," with disorder of affects and emotions, but intellectual functions still preserved. He was probably suffering from a manic-depressive condition; in fact, in one stage of the cycle, he could write verses and compose poems, while in the other stage "he could not put two sentences together and could not make any sense," to quote Dumas' words. When on the stage, this patient was completely in his role, but, when the presentation was over, his symptoms reappeared.

With the knowledge of these few details of his past life, we need not wonder that this patient was given the main role in *Le Bourgeois de Gand*. The other five patients had less important roles: a 51-year-old man affected by hallucinations and ideas of reference, a 32-year-old man suffering from pathological ideas of asceticism, a 33-year-old deaf man full of ideas of grandeur and of contempt toward others, a 47-year-old man who had attempted suicide twice and who believed himself to be possessed by the devil, and a 73-year-old man presenting signs of a senile condition.

The content of *Le Bourgeois de Gand* may be summarized in a few words: Vargas, the hero of the drama, decides to submit for many years to the will of a despot with the idea of liberating his fellow-countrymen from such slavery. He follows the tyrant even in the most cruel enterprises, only to make them more hateful and to prepare the ground for the

fall of the tyrant. In the meantime, secretly, he takes the part of the oppressed and saves the prince of Orange, among others, from death. Finally a revolt is organized and the tyrant is expelled, but during this action Vargas is killed.

From the analysis of Dumas' article it evinces clearly that the roles were distributed according to the patients personality. Felice Persio, having been a comedian for many years, should be considered separately. The second patient, the 51-year-old man, was given the role of the Duke of Alba, a kind and affable person; the third patient, the 32-year-old man, being well disposed toward others, was given the role of the Marquis de las Navas; the fourth patient, the 33-year-old man, represented the role of the prince of Orange, a disdainful and hateful personnage; the 47-year-old patient was given the role of Gidolfo, the murderer of the Earl of Vargas; and the 73-year-old patient represented a Spanish messenger.

It appears that during the performance of some scenes some of the actors deviated considerably from the content of the text. For instance, the 33-year-old patient, the prince of Orange, left the stage during the second act and, after a moment, declaimed a sonnet that he had composed years before. Later he refused to wear peasant's clothes, stating that they were not appropriate for a prince. Even Felice Persio, the main actor, who at the end of the play was lying on the floor supposedly dead, refused to get up, stating that he could not do so, being dead. Both are beautiful examples of the inability of the two patients to distinguish reality from fantasy.

In spite of all this, the public who, to repeat Dumas, had crowded the auditorium of the theatre del Fondo, "very interested in this curious performance, retired, applauding with the greatest intensity."

After this illustration of dramatic play, based on Dumas' description, it seems important to add some considerations of a psychological nature.

First of all, occupational therapy in mental hospitals increasingly gained attention during the early nineteenth century, in Europe as well as in this country. It was around that time that both Rufus Weyman and Ely Todd introduced an active program of occupation for the patients, one at the McLean Asylum, near Boston, and the other at the Hartford Retreat. The general feeling, however, was that the program of occupational therapy was carried on more extensively in Europe than in this country. Pliny Earle reported in this vein, and Isaac Ray, who visited many European mental hospitals in 1844, wrote: "The employment of patients in

some form of useful labor is practiced in all the institutions I visited, and in some to an extent quite unparalled in this country." And he concluded: "Almost everybody seemed to be doing something." [20]

The dramatic presentations, though part of occupational therapy, seem to fall into a special category because of their similarities to modern methods of group therapy, especially psychodrama.

The fact that these patients had agreed to prepare themselves for a performance and went through a period of rehearsals, made them a group specifically motivated and differentiated from the rest of the patients. The functions and the purposes of such a group were clearly defined in the institution. Dr. Miraglia, himself, was in charge of the group before, during, and after the presentations, his role resembling that of a modern group leader. The essential difference is that even though a psychiatrist, Miraglia was not functioning as such in the group. The purpose of the group was not to achieve any psychotherapeutic goal, and Miraglia's aim, as group leader, was not to exercise—at least consciously—any psychotherapeutic influence on the patients in the modern sense of the term. His purpose was simply to keep the patients occupied, to raise funds for the hospitals, and above all—as we have seen—to exercise the functions still healthy in the patient's mind.

There is no question, however, that his approach carried with it therapeutic significance. Dumas himself remarked more than once, probably under Miraglia's influence, that the patients were considerably better while on the stage than while in the hospital. Therefore, the dramatic presentations often assumed the significance of isolated episodes of relatively healthy behavior in the course of the development of the patient's psychosis. Dumas' statement, certainly not a casual one, indicates that there was an understanding, more or less conscious, upon Miraglia's part of the basic therapeutic principles operating in the dramatic presentations.

As an example of this, we may refer to the behavior of the 47-year-old patient who had twice attempted suicide. On the stage he personified Gidolfo, the actor who, in the course of the popular revolt, was supposed to kill the Earl of Vargas with a sword. Miraglia had some doubts, of course, whether to put arms in the hands of a potentially suicidal patient. He finally decided to give him the sword, and rightly so When the moment for the action arrived, Gidolfo passed the sword between the body and the arm of the Earl of Vargas, who fell to the floor, supposedly

[20] Ray, I., Observations on the Principal Hospitals for the Insane in Great Britain, France and Germany, *Am. J. Insanity*, 1846, 2, pp. 289-390.

dead. There is no doubt that this very dramatic scene, so realistically performed, must have aroused strong feelings—a strong catharsis, to use a psychiatric expression—in the patient. Even in the absence of certain information about the successive course of this patient's condition, it can be assumed—on the basis of our present knowledge—that the discharge of aggression toward another person may have prevented the patient from turning his aggression against himself.

It is also important to point out that the theatre audience constituted another dimension of these presentations. The audience attended the performances in a spirit very different from what is generally expected in a theatre today and took this opportunity to give expression to its patriotic feelings, as could not be done openly, at least before 1860.

Therefore the actors received an unusual support from the audience, based more on the feelings aroused by the drama than on their histrionic ability. More than a communion, there was an interaction, at times direct, between public and actors. The performance itself acquired the meaning of a ceremony rather than of a play, and the public was dominated by strong feelings of empathy and pity toward the actors. It would be difficult, otherwise, to understand the fact that the audience took the part of the actors even in situations which were the direct expression of the patient's psychosis: for instance, when Felice Persio, playing Vargas, refused to get up from the floor, saying that he was dead.

This cannot be explained merely on the basis of amusement on the part of the public. Nor is it possible—in view of the strong suggestability that such an homogenous public, almost a collective ego, presented—to think that Miraglia tried to influence the public for his humanitarian purposes. He could certainly count on all those, who—either relatives or friends or attendants of the patients—were present in the room. All this is said to emphasize the particular attitude of the public attending these representations. In other words, there was the effect of a constant, magnifying echo between actors and public, no longer present today in the majority of dramatic performances.

The content of the drama, the preparation and the presentation of the play, and the attitude of the public certainly are all important elements in the theatre. There can be no doubt, however, that the personality of the actor plays the most basic and significant role.

We reach here one of those incommensurable areas of the human mind, where a man—placed between the two antithetical poles, conflicting at times, of reproducing a text and of freely expressing himself—can give an

existential solution and an artistic significance to his work. The actor, even if restricted in the limits of the text, gives life to expressions, words, and feelings, and re-creates the text through his own living personality.

The greatness of the actor consists in consciously assuming a temporary role and in adhering to it, in the most personal manner. Still, such an interpretation of art would not be quite true without admitting the possibility of an inter-penetration of the actor's own personality and his artistic role. Such an inter-penetration, so appealing to the audience, is essentially due to the unconscious forces operating within himself. The actor appeals to the deep sources of his own being, to his voice, gesture, breathing, to the images of his own inner life, to give life to the images of the personnage of the drama. The actor lends his own feelings, his own emotions to the personnage that he represents, who thereby acquires human meaning. It is in this intimate interplay between his own personality and his assumed role that individual and familial echoes are reproduced and that conflctual situations are re-enacted and magnified.

This interplay is particularly harmonious and almost invisible in the great artists. Every artist, however, finds the most true and significant expression of the self, only when—paradoxically—he may lose himself on the stage. In any case the actor, acting out, experiences a feeling of enrichment, of liberation, a real catharsis, in a word. This catharsis, echoed by the unconscious of each spectator, is a major factor in creating an atmosphere of intense communion in the audience. In general, the actor, as it has been said, exercises a function as dispenser of myths in response to the great currents of the collective unconscious. But it is on the stage that this demiurgic activity finds the best condition for its expression, because the theatre has its own tempo, its own rhythms, its own movement, its own space. In a word, only the theatre—quite different from other forms of dramatic art—offers the possibility of an entirely new universe.

These considerations of a psychological and esthetic nature, have been presented here summarily as an introduction to the dynamics of the mental patient and of his world, when performing on the stage as an actor. Under the influence of the theatrical universe, so affectively charged and so dramatically predisposed, his unconscious conflicts are re-enacted, in a magnified way, in the family- and society-like situation that the group offers, and a beneficial cathartic effect is experienced.

It is not possible, within the present context, to enter into more detail regarding the dynamics of these patients, including the therapeutic value

of Miraglia's relationship to them, the importance of the super-ego acting in the group, the absence of love actions in the plays, etc. On all these points, as well as on the position of the dramatic presentations in the realm of modern methods of group psychotherapy, an extensive literature is available today.

Biagio Miraglia, in spite of his unassuming attitude, was a keen observer and must have noticed some beneficial therapeutic effects in the patients engaged in the dramatic presentations.[21] It would otherwise be difficult to understand how he could have continued this type of performance for several years. Even later, after he had retired from the mental hospital of Aversa and become medical director of a private mental institution, he continued this kind of performance as some visitors reported.

His example, unfortunately, was not followed by anyone, either in Aversa or elsewhere. His personality, in many respects so similar to that described by Zilboorg as typical of the medical superintendent of American mental hospitals, "a man humane and learned who was to be physician and guide, master and assiduous pupil," [22] remains somewhat isolated in the history of dramatic presentations given by mental patients. In the broader context of historical continuity, the suggestion left by Caelius Aurelianus in the fifth century to "have the patient deliver discourses or speeches, as far as his ability and strength permit," and that "an audience should be present, consisting of persons familiar to the patient," [23]

[21] In an article of 1865, Miraglia defined the dramatic performances as "a method of therapy and of release of the patient's illness." In the same article he remembered the attitude of the public "who always applauded the performances, a method of great release and of therapeutic significance for the mental patients" (Miraglia, B., Il teatro nel Manicomio di Aversa, *Ann. Frenop. Ital.*, 1865, *3*, 179-180).

[22] Zilboorg, G., *A History of Medical Psychology*, New York, Norton, 1941, p. 409.

[23] The entire passage of Caelius Aurelianus (*On Acute Diseases and on Chronic Diseases*, English translation by I. E. Drabkin, Chicago, The Univ. of Chicago Press, 1950, pp. 547-549), reads as follows: "And so after the reading let him [the mental patient] see a stage performance. A mime is suitable if the patient's madness has manifested itself in dejection; on the other hand, a composition depicting sadness or tragic error is suitable in cases of madness which involve playful childishness. For the particular characteristic of a case of mental disturbance must be corrected by emphasizing the opposite quality, so that the mental condition, too, may attain the balanced state of health. And as the treatment proceeds, have the patient deliver discourses or speeches, as far as his ability and strength permit. And in this case the speeches should all be arranged in the same way, the introduction to be delivered with a gentle voice, the narrative portions and proof more loudly and intensely, and the conclusion, again, in a subdued and kindly manner. This is in accordance with the precepts of those who have written on vocal exercise (Greek *anaphōnēsis*). An audience should be present, consisting of persons familiar to the patient; by according the speech favorable attention and praise, they will

found an application fourteen centuries later, through the work of Biagio Miraglia. From a psychiatric viewpoint, Miraglia's name should be mentioned among the precursors of the modern methods of group psychotherapy; and in this connection, the name of Dumas, father, should also be mentioned, as it is to him that we owe an accurate description, and a literary one, of this early and forgotten psychotherapeutic attempt.

ACKNOWLEDGMENT OF ILLUSTRATIONS

Figures 1 and 3 are from Biagio Miraglia, Un grande frenologo Italiano, Biagio G. Miraglia, *Boll. Ist. Storico Ital. dell'Arte Sanitaria*, 1929, *9*: 217-243. Figure 2 is from a privately printed card sent to me by Dr. Biagio Miraglia, Jr., grandson of Biagio Miraglia. I wish to express my thanks to Dr. Miraglia for his courtesy.

help relax the speaker's mind. And, in fact, any pleasant bodily exercise promotes the general health. Soon after the discourse or speech, the patient should be taken and gently anointed; he should then take a light walk for exercise."

AMERICAN ASSOCIATION OF THE HISTORY OF MEDICINE

ABSTRACTS OF PAPERS READ AT THE TWENTY-NINTH ANNUAL MEETING*

Durham, North Carolina

April 19, 20, and 21, 1956

Thursday Afternoon, April 19, 1956: Symposium: The History of Medicine in the South

INDIAN MEDICINE IN EARLY NORTH CAROLINA

WARNER WELLS

This paper draws on the impressions and accounts of voyagers, explorers, settlers, and others who first encountered the Indian inhabitants. Background for an understanding of their health problems is provided by an account of the principal tribes, their number, where and how they lived, and their social and climatic environment. Physical attributes, prowess and skills are described. The major threats to the health of the American Indian were: epidemic diseases introduced from Europe; trauma incurred by fighting, natural hazards, and through exposure to the elements; and a disease in the body politic of the European invaders who could not or would not recognize the Indian's right to land or property. This latter ultimately led to his virtual extinction. Medical practice was empiric, embracing a large pharmacopoea of herbs and animal concoctions, mingled with superstition, magic, and mystery. As one would expect, the Indian doctor was best at handling surgical infection and trauma, and was very often scarcely less skillful than his European pre-Renaissance counterpart.

SECTIONAL CONFLICT AND MEDICAL EDUCATION IN LOUISIANA

JOHN DUFFY

The unprecedented world prosperity of the 1850's was marred in the United States by the developing clash between North and South on the issue of slavery. New Orleans, with easy access to the interior of the United States, in the antebellum period seemed peculiarly destined to assume economic and social leadership in the South. By 1850 she was already demonstrating her leadership in the field of medicine. The Medical College of the University of Lousiana was well established, the *New Orleans Medical and Surgical Journal* was beginning a career

* The abstracts provided by the speakers have been edited by the Editorial Committee of the Association.

which would carry it on down to the present, and the wealth of material available in the great Charity Hospital was attracting medical students in large numbers to the city.

With the rise of sectionalism and the demand for Southern education for Southerners, a great impetus was given to medical education in New Orleans. A second medical school was founded and enrollment in both schools shot upwards. Additional medical publications appeared, post-graduate work was offered, and, in short, prospects appeared bright.

This brief flowering of medicine in New Orleans was brought to an abrupt halt by the outbreak of the Civil War. The impact on New Orleans was almost disastrous. Temporarily all medical publications and formal medical education ceased. The advent of peace brought desperate efforts to revive New Orleans as a medical center. However, the problems of Reconstruction and economic adjustment proved too great, and only one medical school and one medical journal managed to survive the hectic postwar years. Had the sectional conflict been resolved peaceably, it is more than likely that Louisiana's initial advantages and early start would have enabled her to maintain her position as a leading medical center. As it was, the twentieth century was well advanced before she regained her prewar level.

JOSIAH C. NOTT, SOUTHERN PHYSICIAN

GEORGE J. D'ANGELO

During the first half of the nineteenth century yellow fever had been running rampant through the South. Mobile, Alabama, where Josiah C. Nott (1804-1873) spent most of his life, did not escape the recurrent epidemics. The "bad air" was felt to be the cause of yellow fever as of many other diseases. Nott, who was a very astute physician with keen powers of observation, concluded that the mosquito, or some tiny insect of similar habits, was the etiologic agent. In 1848 he published his theory in the *New Orleans Medical and Surgical Journal*. He was the first person to implicate the mosquito directly with yellow fever, but not quite in the sense in which we view it today. This paper was a notable contribution to medical science and antedated Carlos Finlay and Walter Reed by many years, but it was concerned, unfortunately, with a theory of etiology and not with disease transmission primarily.

Another controversial subject prevailing about this same time was the origin of mankind. The current belief of the time was the unity of mankind. However, Samuel G. Morton and his followers, of whom Nott was one, were of the opinion that there was a diversified origin of the races. Nott was a very staunch believer in the geographical origin of the races and wrote several books, in addition to lecturing extensively to expound this new theory. The notoriety received because of this new issue was overwhelming. There is no doubt that Nott was influenced by his great disdain for the negro, as shown in his letters to E. G. Squier. With George R. Gliddon, Nott compiled many facts in an effort to prove to the world the multiple origin of the races in a monumental volume, *Types of Mankind*, published in 1854. This book of course was well received in the South and used as ammunition, during the pre-Civil War years, against emancipation of the slaves.

Thursday Afternoon, April 19, 1956: Illustrated Lecture

MEDIEVAL ILLUMINATED MEDICAL MANUSCRIPTS

LOREN C. MACKINNEY

From his collection of about 2,000 microfilms of medical miniatures in medieval medical manuscripts, Professor MacKinney presented 80 selections in color projection, commenting briefly thereon. They included miniatures dating from as early as the sixth century (the illustrated Greek Dioscorides at Vienna). Most of the examples, however, were from late medieval Latin manuscripts conserved in Vienna, Munich, Florence, Bologna, the Vatican, Leiden, Brussels, Basel, Madrid, Paris, London, Oxford, Cambridge, Glasgow and smaller centers. The medical topics illustrated included early Christian, classical, Moslem and Western physicians, medical education, clinics and hospitals, methods of diagnosis (e. g., by urinalysis, pulse, etc.), methods of healing (e. g., by simple *materia medica* and compounded medicines, by purging, bleeding, surgery and cautery), the reducing of dislocations, bandaging, obstetrics, healing baths, dentistry and veterinary medicine. The illustrations revealed not only the wide variety of medical practices in the Middle Ages, but also the realism and artistic beauty of the miniatures in medical manuscripts. Professor MacKinney offered to allow any persons interested in obtaining reproductions from the collection for scholarly purposes the opportunity of having photoreproductions made at Chapel Hill.

Friday Morning, April 20, 1956: General Session

PIONEERS OF VIROLOGY

MORRIS C. LEIKIND

The origins of virology are to be found in many lands. Adolph Edward Mayer of Holland first described and named the mosaic disease of tobacco and demonstrated its infectious nature in 1879. He was followed by Dmitri Ivanowski in Russia who in 1892 showed that the agent of the disease would pass through filters capable of holding back ordinary bacteria. In 1898 Martin Beijerinck of Holland confirmed Ivanowski's work and showed further that the agent would diffuse through agar. In the same year Friedrich Loeffler and Paul Frosch of Germany found that the causative organism of foot and mouth disease was a filter-passing, ultra-microscopic virus. In 1902 Walter Reed and James Carroll, Americans, demonstrated that yellow fever was also caused by a filterable virus. A number of important diseases affecting plants, animals and men were subsequently shown to belong to this class. In 1915 F. Twort, an Englishman, discovered a virus disease of bacteria. This phenomenon was independently rediscovered by F. d'Herelle, a French-Canadian, who named it bacteriophage.

The modern period in virology dates from the 1930's when the electron microscope and the ultra centrifuge were developed and methods of tissue culture and the use of embryonated eggs were introduced for the cultivation of viruses. In 1935 came the revolutionary discovery by Wendell M. Stanley of the crystalline nature of tobacco mosaic virus.

MEDICINE IN THE SPAIN OF DON QUIXOTE

FELIX MARTI-IBANEZ

(This paper was not presented)

Spanish medicine, like Spain itself, in the Golden Age was a vast multicolored tapestry woven out of passionate contradictions. If Spanish individualism hampered the progress of scientific research, on the other hand encyclopedism, humanism and the avid curiosity of the physicians widened the clinical horizon of medicine and speeded its progress.

The yearning to explore new worlds was also translated into the urge to unveil the mysteries of the human body, thereby stimulating anatomy. The endless wars and military campaigns made possible the progress of surgery and traumatology, and forced medical attention to focus on epidemiology and nosology, as "fevers" and "the plague" were national scourges. The national incidence of gout, *garrotillo*, urinary tract stones and *tabardillo* also spurred the study and treatment of these diseases.

The greatest glory of the Spain of the Golden Age lay in its humanist-physicians, who integrated science and conscience, thought and belief, medicine and philosophy, scientific spirit and professional humanitarianism. These men performed feats in psychiatry and medical philosophy, and they established the foundation upon which it would be possible to build the future Spanish medicine. They made ideals of service and healing. Their dedication to these ideals is the proudest heritage handed down by that passionately quixotic country which was the Spain of Don Quixote.

In the work of the anatomists Gimeno, Laguna, Lobera de Avila, Montaña de Monserrate, Collado, Sánchez, Valdés and Juan Valverde; of the surgeons Fragoso, Arceo, Hidalgo de Agüero, Daza Chacón, López de Léon, Vigo; of the nosologists and epidemiologists Villalobos, Vallés, Toro, Mercado, Porcell; the "specialists" Soriano, Velázquez, Chirino, Acosta, Carbón, Valdés, Diaz, Leiva, Aguilar, Perez de Herrera, Vega, Hernández; of the humanists Laguna, Lobera de Avila, Servet, Pereira, Sabuco de Nantes, Huarte de San Juan, Sánchez—is written the story of medicine in sixteenth and seventeenth-century Spain, one of the most fascinating chapters in the history of modern medicine.

DEBORAH SAMPSON, ALIAS ROBERT SHIRTLIFF, FIGHTING FEMALE OF THE CONTINENTAL LINE

WILLIAM FREDERICK NORWOOD

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MEDICAL EDUCATION IN 19TH CENTURY FRANCE

ERWIN H. ACKERKNECHT

The French revolution abolished all old universities with their medical faculties in 1792. It created in 1794 new medical schools, "Ecoles de Santé," the structure of which was practically unchanged till the end of the century, though Napoleon gave them again the misleading title of Faculties of Medicine. Teaching in these schools was primarily ward instruction. They were the best schools of the time, as evidenced by the masses of Americans and Europeans who flocked to Paris to receive their medical education; their professors—Corvisart, Pinel, Laennec, Broussais, Desault, Dupuytren—were the leaders of world medicine. But they were practical schools, paying little attention to the medical sciences, which in the educational system created by the French revolution were segregated in special research institutions (Collège de France, Museum), when not ignored altogether. None of the pioneers of the medical sciences in France in the 19th century, neither Magendie nor Flourens, Claude Bernard, Poiseuille, Paul Bert, Marey, Raspail, Dutrochet, Donné, Davaine nor Pasteur, was ever a professor in a medical school. French medicine therefore lost supremacy in the 1850's to Germany, where the medical sciences had been intensely cultivated in the medical faculties of the modernised universities since the 1820's. Under the Third Republic, especially in 1878 and 1892, important reforms of the system were introduced. But as far as French supremacy in medicine was concerned, these reforms were "too little and too late."

DRAMATIC PRESENTATIONS BY MENTAL PATIENTS IN THE MIDDLE OF THE NINETEENTH CENTURY AND A. DUMAS' DESCRIPTION

GEORGE MORA

Published in full in this *Bulletin*, May-June 1957 *31*: 260-277.

CHARLES E. MORGAN AND HIS *ELECTRO-PHYSIOLOGY AND THERAPEUTICS*

PAUL F. CRANEFIELD

Published in full in this *Bulletin*, March-April 1957, *31*: 172-181.

Friday Afternoon, April 20, 1956: Symposium: The History of Epidemiology

AMERICAN EPIDEMIOLOGY BEFORE THE CIVIL WAR

WILSON G. SMILLIE

The author brought out the fact that excellent epidemiological studies were carried out in America even during Colonial days, and long before the physicians had accurate knowledge of the specific agents of disease. Smallpox was the great epidemic disease of the Colonial period. Its essential epidemiology was well understood and preventive measures (inoculation) were first employed in 1721. Yellow fever did not invade the mainland to an extensive degree until 1790. Epidemic waves followed for over a century. The epidemiology of this disease and its social and economic effects were discussed.

The two great epidemiologists of America were Oliver Wendell Holmes, who studied so effectually the epidemiology of "Childbed Fever," and Daniel Drake, whose great book on *The Diseases of the Interior Valley of North America* was published in 1850. This book is the greatest epidemiological thesis that has ever been produced in America. The paper concluded with a short synopsis of Drake's findings in malaria.

BENJAMIN RUSH, JOHN MITCHELL AND YELLOW FEVER

SAUL JARCHO

Published in full in this *Bulletin*, March-April 1957, *31:* 132-136.

A HISTORICAL APPROACH TO EPIDEMIC MENTAL DISORDERS

ERNEST M. GRUENBERG

There is an obvious link between the study of the history of diseases and the epidemiological study of diseases. Epidemic mental disorders provide an example of this link. The dancing manias, household outbreaks of psychoses, as exemplified in folies à deux, group panics, exaltations, riots and rampages, are described as types of epidemic mental disorders. Temporal analysis in terms of (1) man's history; (2) changes during the lifetime of the disorder; (3) the development and termination of each outbreak; (4) seasonal distribution of outbreaks, and (5) the lifetime of the individuals affected are required. Tentative analyses in these five terms of Dancing Manias, Household Outbreaks, and some types of Riots and Panics were summarized on the basis of a brief review of the readily available literature. Historical research can add to our understanding of these phenomena. This requires recognition of the explanations favored by different recorders, consequent search for extant records, and thus estimations of the actual sequence of

events in each outbreak. Explanations offered by various investigators were summarized and classified. From this review it appears that future research might test the hypothesis that the way disordered thinking, feeling, and behaving spread from person to person is no different from the way constructive and healthy ways of thinking, feeling and behaving spread.

Friday Evening, April 20, 1956: The Fielding H. Garrison Lecture

MEDICINE AND THE HISTORIAN

F. N. L. Poynter

Published in full in this *Bulletin*, September-October 1956, *30:* 420-435.

Saturday Morning, April 21, 1956: General Session

CALVIN JONES: SOME OF HIS CONTRIBUTIONS TO MEDICAL PRACTICE IN NORTH CAROLINA AND TENNESSEE

S. R. Bruesch

Published in full in this *Bulletin*, May-June 1957, *31:* 246-259.

EZRA MUNDY HUNT, 1830–1894, PIONEER OF PUBLIC HEALTH

Fred B. Rogers

One of the leaders of the nineteenth century public health movement in the United States, Dr. Ezra M. Hunt has recently received increasing recognition for his role in this era of progress. In 1953 the American Public Health Association included Hunt among the great pioneers of public health in this country, citing him as the foremost leader in health organization administration and the originator of our modern concepts of rural health services.

Born at Metuchen, N. J., on January 4, 1830, and educated at Princeton (A. B. 1849) and Columbia (M. D. 1852), Hunt taught at the Vermont Medical College at Woodstock for a year before undertaking general practice in Metuchen. An Army surgeon during the Civil War, he was elected the 71st President of The Medical Society of New Jersey in 1864. Two years later he headed the newly-organized State Sanitary Commission, which sent him to Europe with John Shaw Billings in 1876 preparatory to the establishment of the New Jersey State Department of Health in the following year. Secretary of the Department from its organization until his death seventeen years later, Hunt devoted much effort to improving the health services in New Jersey.

A charter member of the American Public Health Association, Ezra Mundy Hunt became its tenth president in 1882. Secretary (1875) and Chairman (1877) of the Section on State Medicine and Public Hygiene of the American Medical Association, he also served as a Vice-President of the Association in 1880.

He was a voluminous writer: 62 entries appear under his name in the *Index Medicus* between 1859 and 1894. Of lasting interest are his studies on communicable disease control, epidemiology, and public health practice. An early health educator, Dr. Hunt introduced the teaching of hygiene at the Trenton Normal School in 1876 and headed its department of physical education. (This institution, now the New Jersey State Teacher's College at Trenton, celebrated its centennial year during 1955-1956). Dr. Hunt also wrote a text-book on hygiene in the school and home.

Recipient of honorary degrees from Princeton (Sc. D. 1882) and Lafayette (LL. D. 1890), he was also an honorary member of the Epidemiological Society of London (1888). Dr. Hunt died on July 1, 1894, much esteemed for his many contributions on behalf of public health.

(Note: The full text of this paper appeared in *The Journal of the Medical Society of New Jersey*, Volume 53, pp. 554 ff.)

BENJAMIN FRANKLIN AND THE RISE OF FREE TREATMENT OF THE POOR BY THE MEDICAL PROFESSION OF PHILADELPHIA

ROBERT J. HUNTER

Published in full in this *Bulletin*, March-April 1957, *31:* 137-146.

JEFFERSON ON THE MEDICAL THEORY AND PRACTICE OF HIS DAY

COURTNEY R. HALL

Published in full in this *Bulletin*, May-June 1957, *31:* 235-245.

THE NATURE OF MEDICAL ERROR: A STUDY IN APPLIED MEDICAL HISTORY

FREDERIC D. ZEMAN

Erroneous medical attitudes persisting through many centuries may be placed in three large groups, namely, unquestioning acceptance of authority, misapplications of the scientific method, and the effects of the emotions upon physicians' thinking. Examples from remote and recent history illustrate that faculty precepts are commonly supported by plausible reasoning, are often without experimental

confirmation, and are commonly backed up by the solid authority of highly respected teachers. Error keeps good company and often moves in the best circles.

The mistakes of this generation will be revealed by our successors who have been encouraged to question authority, trained to test all findings with exacting precision, and warned to eliminate emotional factors, as far as is humanly possible.

THE FAMOUS HARRISON CASE AND ITS REPERCUSSIONS

LINDEN F. EDWARDS

Published in full in this *Bulletin*, March-April 1957, *31:* 162-171.

MEDICO-HISTORICAL NEWS AND ACTIVITIES

ANNOUNCEMENTS

AMERICAN ASSOCIATION OF THE HISTORY OF MEDICINE

The Thirtieth Annual Meeting of the American Association of the History of Medicine was held in Richmond and Williamsburg, Virginia, May 6, 7, and 8, 1957. The following actions taken are brought to the attention of members in advance of the publication of the full report in a later issue.

Elections: John B. Blake, Secretary-Treasurer.

Awards: The William Osler Medal was awarded to Sebastian R. Italia of the Yale University School of Medicine for his essay, "Elisha North: Experimentalist, Epidemiologist, Physician 1771-1843." Honorable Mention was awarded to William D. Sharpe of the Johns Hopkins University School of Medicine for his essay entitled "Isidore of Seville and the Tradition of Medicine in the Early Middle Ages" and to Russel W. Van Norman of the University of Texas Southwestern Medical School for his essay entitled "Antebellum Physicians of Dallas, Texas."

Annual Meeting, 1958: The Thirty-First Annual Meeting will be held in New York City. Dr. Iago Galdston, New York Academy of Medicine, 2 East 103rd Street, New York 29, New York, has been appointed chairman of the Committee on Program and Local Arrangements.

Incorporation: The members voted to incorporate the Association and ratified the appointment of a committee to effect the necessary legal steps. They also voted to change the name of the Association at the time of incorporation to American Association for the History of Medicine.

Members of the Association are also advised that after July 1, 1957, the address of the Secretary-Treasurer will be: c/o Smithsonian Institution, Washington 25, D. C.

NATIONAL NEWS

Harvey Tercentenary

A "Harvey Tercentennial Celebration" was announced by the New York Medical College, Flower and Fifth Avenue Hospitals, for April 12, 1957. Opening remarks by the Dean of the College, Ralph E. Snyder, were followed by papers presented by Felix Marti-Ibañez, on "Padua and London (A Harveian Tale of Two Cities)," and Douglas Guthrie, on "The Adventures of William Harvey, and of His Discovery."

The Johns Hopkins Medical History Club presented the following Harvey Tercentenary Program on April 29, 1957: "Harvey and Before. Recent Contri-

butions to the History of Cardiovascular Physiology," Owsei Temkin; "The Rev. Stephen Hales: His Contributions to Cardiovascular Physiology," Philip Bard; "The Contributions of a Medical Student (Rouanet), a Veterinarian (Chauveau) and an Engineer (Reynolds) to the Understanding of Cardiovascular Sound," Victor A. McKusick. A special exhibition, arranged by Dr. McKusick and associates on "The History of Cardiovascular Sound," is on display at the Institute of the History of Medicine.

Personal

On June 26 Oxford University will confer the honorary degree of doctor of letters on Dr. John F. Fulton, Sterling Professor of the History of Medicine at the Yale University School of Medicine, and Editor of the *Journal of the History of Medicine and Allied Sciences.*

The University of Illinois College of Dentistry, Alumni Association and Faculty are sponsoring a banquet on June 8, 1957, in honor of Nell Snow Talbot on her retirement. Mrs. Talbot, administrative assistant of the College, served as professor of the History of Medicine and Dentistry. A Nell Snow Talbot Instructorship Award was established in 1950 by the student body to honor excellency in individual instructors.

Ilza Veith, M. A., Ph. D., has been promoted to the rank of Associate Professor in the History of Medicine in the Departments of Medicine and History of the University of Chicago.

George Urdang, Ph. G., D. Sc. Nat., Sc. D. (h. c.), Emeritus Professor of the History of Pharmacy at the University of Wisconsin and Director of the American Institute of the History of Pharmacy, will celebrate his seventy-fifth birthday on June 3, 1957. The *Bulletin* extends its cordial congratulations to Dr. Urdang on this occasion.

NEWS FROM ABROAD

Cuba

The new officers of the Cuban Society of the History of Medicine elected for the period 1957-1959 are as follows: President: Dr. Horacio Abascal; Vice-president: Dr. Saturnino Picaza; Secretary: Dr. César Rodríguez Expósito; Vice-secretary: Dr. César Mena Serra; Treasurer: Dr. Estebán Valdés Castillo; Vice-treasurer: Dr. Héctor Zayas-Bazán; Members: Drs. Rodolfo Pérez de los Reyes, Rodolfo Tro and Luis Felipe Le Roy.

BROOKE HINDLE. *The Pursuit of Science in Revolutionary America, 1735-1789.* Chapel Hill: University of North Carolina Press, 1956. xi + 410 pp. Ill. $7.50.

The history of science in colonial and revolutionary America is a relatively untilled field and Brooke Hindle in the monograph reviewed here has made an important contribution to it. It should be noted at the outset that the term "Revolutionary America" in the title refers to the generation that participated in the American Revolution, and it is with this group from 1735 to 1789 that the author is concerned. Thus, the study is divided into periods from 1735 to 1765, 1763 to 1775, and 1775-1789.

The story opens in 1735 when the influence of the English Enlightenment began to be felt in the colonies. Evidence of this influence may be seen in Benjamin Franklin's exalted aspirations for American achievement in science, in his hope that Americans would contribute to the advancement of science, and his conviction that the promotion of science would yield very practical benefits. Against this backdrop, Hindle traces the beginnings of science in this country from 1735 to 1765. The contributors to scientific knowledge during this period were physicians, naturalists, and college teachers. Natural history was the major focus of interest. Since its discovery America was a paradise for anyone interested in zoology and botany, for collectors of marvels, for horticulturists. Specimens of animals, plants, minerals were brought back to Europe providing the basis for several famous collections. Financial backing was provided in some cases by patrons and collectors such as Sir Hans Sloane.

As a result, by the middle of the 18th century an international group devoted to natural history had developed in Europe and America, with ramifications in England, France, Holland, Sweden, Germany, and Italy. Best known today of the American members of this group is the botanist John Bartram. Both in Europe and America, physicians were prominent in the study of natural history. Among them may be mentioned Cadwallader Colden of New York, William Douglas of Boston (remembered today chiefly for his part in the variolation controversy), and Alexander Garden of Charleston.

At the same time, these scientific interests were closely linked to economic, social, and political developments. A sense of belonging together as Americans spurred among the colonists a nascent cultural nationalism which found its reflection in science. Increase of population and wealth provided a basic underpinning, to which were added, as time went on, improved roads, better postal service, closer commercial ties among the colonies, as well as common military endeavors, as for example, the capture of Louisburg in 1745. Simultaneously, one cannot overlook the fact that many of the activities carried on in science were similar in character to those found contemporaneously in England. "Projects" were as popular in the colonies as in the mother country, but their fate was often dissimilar. Franklin, for example, organized fire companies, a library, and endeavored to set up a

scientific academy, the American Philosophical Society. It is, however, in the fate of the latter project that the interplay of the various factors, and the difference between England and the colonies is clearly evident. Because it did not have the necessary support from the merchants and gentlemen, Franklin's project died in 1747, while under more favorable auspices later in the century the revived Society was able to take root and grow. On the other hand, the Royal Society which was supported by the London mercantile community succeeded in establishing itself. In part, the later success of Franklin's project, the American Philosophical Society, was due to the growth of cultural nationalism, an aspect of the process which led to the Revolution.

Hindle traces the effect of the Revolution and the first post-Revolutionary years on the pursuit of science. He indicates clearly that despite a great deal of talk and some action, the results were still quite meager. Nevertheless, it is obvious that the revolutionary spirit did help to release new energies and to create conditions conducive to the further growth of science.

Clearly, this is a solid contribution to the history of American culture. About the only criticism that one might make is that too often the story drops to the level of a chronicle, although the interpretation introduced at various points helps to tie it together. Dr. Hindle has added an impressive piece of evidence in favor of the view that the development of science must be seen not as something *sui generis* but in relation to political, economic, and social factors.

GEORGE ROSEN

ERNA LESKY. *Arbeitsmedizin im 18. Jahrhundert.* Werksarzt und Arbeiter im Quecksilberbergwerk Idria. Wien: Notring der wissenschaftlichen Verbände Oesterreichs, 1956. 79 pp., 4 tables. Ill. Aust. shillings 19.80.

This slim volume is an important contribution to the history of industrial mercury poisoning, its public health aspects, and technology. Its focus is the mercury mine at Idria, a mining town in Carniola, Austria, 25 miles west of Laibach (Ljubjana). The rich mines of quicksilver, discovered in 1497, have been under government management since 1580 and they rank second to those of Almadén in Spain. After the treaty of St. Germain, Idria went to Italy and now belongs to Yugoslavia. The volume is based on original reports from the eighteenth century, found by Dr. Lesky at the state archives of Vienna, and it supplements very happily the standard books by G. Rosen and L. Teleky on the history of mining hygiene.

The well-organized book lacks, unforunately, a table of contents. This may be reconstructed in the following way: Preface (3-6), Idria and its history (6-10), The barber-surgeon of the plant (10-23), The physican and surgeon of the plant (23-36), The workers (37-50), Outlook (50-53), Documents (54-60), Notes and references (61-66), Illustrations and tables (67-79 + I-iv). An outstanding feature is the list of references with 109 items (!). Because of its completeness this list may to some extent replace an index, which is not given, as in most books of small size.

The mines of Idria were visited and described by famous physicians and scien-

tists: Paracelsus, Agricola, and Mattioli, and also mentioned by Athanasius Kircher. In the eighteenth century well-known physicians like J. A. Scopoli (pp. 24-30) and B. Hacquet (pp. 31-36), were in charge of medical and surgical care at the mines, while the famous clinician G. van Swieten paid much attention to the control of the occupational diseases of the place. It is worth noting that as early as 1548 the workers founded a fund for compensation in cases of accidents and illness (p. 11) which was in operation during the eighteenth century, thus supplementing the often meagre governmental budget for medical care of the miners.

The chapter entitled "The workers" is especially well written and depicts the dangers of the occupation, the technological details, and the improvement in the workers' condition in the eighteenth century. This improvement is credited to the Viennese authorities, the local administration (A. Hauptmann), and the efforts of the doctors in charge. The important role of van Swieten as patron of these activities has been stressed and documented.

A very informative document is reproduced on pages 56-57. This is a list of surgical instruments which, Hacquet suggested, should be secured for the mines of Idria. This reviewer was impressed by two items: (1) instruments for operation on arteries (sic!), p. 56; (2) *speculum oculi*, p. 57. Hacquet was acquainted with the most recent literature and quoted the sources where the instruments had been described or depicted: for the arteries, in Plenck (also spelled Plenk), *Sammlungen*, t. 2, fig. 1, Wien, 1770; for the eye speculum, Zimmermann, *Abhandlungen chirurgischer Operationen*, t. 1, tab. 7, fig. 5, 1757. Tracing of these sources would help to enhance our knowledge of surgery in the year 1770.

The illustrations are aptly chosen from various sources which are not easily accessible. The volume belongs to the series *De Morbis Artificum Scripta*, a name taken from the title of Ramazzini's classical treatise on occupational diseases.

JOSHUA O. LEIBOWITZ

ERWIN H. ACKERKNECHT and HENRI V. VALLOIS. *Franz Joseph Gall, Inventor of Phrenology and his Collection.* Translated from the French by Claire St. Léon. Preface by John Z. Bowers. Wisconsin Studies in Medical History, No. 1. Madison, Wis.: Department of History of Medicine, University of Wisconsin Medical School, 1956. 86 pp. Ill. $1.50.

The once so popular Gall and his "organology" have become an almost forgotten chapter of medical history. This treatise revives the human figure and the teaching of the famous "phrenologist," it discusses in a faithful and intelligible manner the basic constituents of this teaching, the history of the whole movement and its once powerful influence on all spheres of human knowledge, in particular anthropology and the social sciences. The treatise carries a chapter on Gall's collection (containing 221 skulls, 102 casts of heads, and 31 casts of brains) and the catalogue in the Paris Musée de l'Homme. The twentieth century reader's main interest will focus on Gall's psychophysiology, and he will welcome its didactic presentation as a fourfold thesis, i. e. that of the *instrumental* role of the senses in the manifestations of the so-called innate faculties, that of an organic equipment of the moral and

intellectual qualities of the soul, that of the brain as the organ of all the faculties, tendencies, and feelings and, last but not least, the multiplicity of the cerebral organs and of the faculties or tendencies thought to correspond to these organs. Thus was decomposed man's wholeness and unity into twenty-seven faculties the number of which could be increased or decreased at will and the elementary nature of which never ceased to arouse debate and scepticism.

The book—the first in the Wisconsin Studies in Medical History—will reach its readers and fulfil its purpose, namely to make them familiar with the life and work of one of the most learned, original, popular, and extravagant medical writers of the early nineteenth century. Evidently, the authors did not consider it their task, to project Gall's ideas on the scientific horizon of our time and to test the truths and errors of phrenology in the light of our own views, observations, and experimentations, the doctrine of cerebral localization emerging as one of the most challenging though unavowed survivals and revivals of organology. This reviewer has still to be convinced that there is a *basic* difference between Gall's palpating finger and the tracing electrode of the experimental neurophysiologist, though nobody will deny to the latter the refinement of his method. But what is common to both is the exploration and interpretation of *regional* structures and activities, and it is just the legitimacy and, above all, the limits of this pre-conceived idea of strictly regional activities which are at stake today just as in the days of Gall, who, incidentally, refrained from localizing instinct, understanding, reason and will, free or not.

This reviewer cannot resist the temptation to recall the conclusion reached by him, more than 20 years ago, in his own studies on Gall which did not escape the authors of the present treatise. Indeed, Gall did not realize the fundamental difficulties which are implied in our localizing efforts and which result from our intention to ascribe *spatial* qualities to psychic phenomena, to ignore the *chronological* nature of the latter and thus to correlate in a given case *stages* of diseases and syndromes with the same and unchanging sites of structures and lesions.

WALTHER RIESE

HERMANN TRIEPEL. *Die anatomischen Namen Ihre Ableitung und Aussprache.* 25. Auflage, völlig neu bearbeitet und entsprechend den neuen anatomischen Namen (Pariser N. A.) ergänzt von Robert Herrlinger. München: J. F. Bergmann, 1957. 82 pp. D. M. 6.80.

The late Professor Triepel prefaced the first edition of this book in 1905, and since then it has remained popular among German students. It offers, in alphabetical order, a short explanation of anatomical terms together with their Latin, Greek, etc. derivation. While Triepel based his edition on the Basel *Nomina Anatomica* of 1895, the present revision takes into account the Paris *N. A.* of 1955. An important feature which enhances the value of the book for readers outside of Germany is an increase in the number of historical references by the new editor, Dr. Herrlinger, who is professor of the history of medicine at the University of Würzburg.

OWSEI TEMKIN

THE BULLETIN RECENTLY RECEIVED *

Acta Medicae Historiae Patavina. Vol. II, 1955-56. Padova: Istituto di Storia della Medicina dell'Università di Padova, 1957. vii + 174 pp. Ill.

Luigi Belloni. *Documenti Bassiani.* Per il XVII Congresso della Società Italiana di Medicina Interna e il LVII Congresso della Società Italiana di Chirurgia (Milano, 15-18 Ottobre 1956). 40 pp. Ill.

Alfonso A. Castaño Almendral. *La obra tocológica del Doctor Babil de Gárate.* Salamanca, 1956. Publicaciones del Seminario de Historia de la Medicina de la Universidad de Salamanca. Serie A: Estudios. Tomo 1, Núm. 2, pp. 83-136.

Catalog of the Florence Nightingale Collection. New York: Department of Nursing, Faculty of Medicine, Columbia University-Presbyterian Hospital, School of Nursing, 1956. vi + 79 pp. $2.00.

Louis Cohn-Haft. *The Public Physicians of Ancient Greece.* Smith College Studies in History, Volume 42. Northampton, Mass.: Department of History of Smith College, 1956. x + 91 pp. $1.50.

Leonard K. Eaton. *New England Hospitals, 1790-1833.* Ann Arbor: University of Michigan Press, 1957. ix + 282 pp. Ill. $6.00.

Luis S. Granjel. *La doctrina antropológico-médica de Miguel Sabuco.* Salamanca, 1956. Publicaciones del Seminario de Historia de la Medicina de la Universidad de Salamanca. Serie A: Estudios. Tomo 1, Núm. 1, pp. 1-81.

Charles Lichtenthaeler. *La médecine Hippocratique.* Études sur le raisonnement clinique, 2e Série. Boudry, Neuchâtel: à la Baconnière, 1957. 144 pp. Ill.

Moshe Ben Maimon. *Regimen Sanitatis.* Letters on the Hygiene of the Body and of the Soul. Hebrew translation of R. Moshe Ibn Tibbon, edited by Suessmann Muntner. Jerusalem: Mossad Harav Kook, 1957. xviii + 254 pp.

Orlando Sattamini-Duarte. *Um médico do Império.* O Doutor Tórres Homem, 1837-1887. Rio de Janeiro: Irmãos Pongetti Editores, 1957. 186 pp. Ill.

Richard Harrison Shryock. *National Tuberculosis Association, 1904-1954.* A Study of the Voluntary Health Movement in the United States. New York: National Tuberculosis Association, 1957. 342 pp. Ill. $3.50.

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* The *Bulletin* reserves freedom of decision as to the publications to be listed in this section. Items received, other than those assigned for review, are ultimately incorporated into the collection of the Institute of the History of Medicine.

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